SCIENTIFIC DISCUSSION

VOL 1, No 114, (2026)

Scientific discussion
(Praha, Czech Republic)

ISSN 3041-4245

The journal is registered and published in Czech Republic.
Articles are accepted each month.
Frequency: 12 issues per year.
Format - A4
All articles are reviewed
Free access to the electronic version of journal

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SECTION OF CHEMICAL SCIENCES

STUDY OF THE TERNARY SYSTEM PR-BI-TE OF SECTIONS BI_2TE_3-PR_3TE_4, PRTE-BI, PRTE-PRBI, PR–BI_2TE_3

Mammadova S.
PhD in Chemistry Associate Professor,
Baku State University, Baku, Azerbaijan
Ismailov Z.
PhD in Chemistry Associate Professor,
Baku State University, Baku, Azerbaijan
Mirzoeva R.D.
Research assistant,
Baku State University, Baku, Azerbaijan
Hasanova Z.
Researcher
Baku State University, Baku, Azerbaijan
Sultanova S.
Researcher
Baku State University, Baku, Azerbaijan
DOI: 10.5281/zenodo.21934722

Abstract

Phase formation in the ternary Pr-Bi-Te system was studied using physicochemical analysis methods. T-x diagrams of the internal sections of the system were constructed: Bi_2Te_3-Pr_3Te_4, PrTe-Bi, PrTe-PrBi, Pr–Bi_2Te_3. A new ternary compound of the composition PrBiTe3 and a solid solution region of ~3-5 mol.% at 300 K were discovered in the system. It was established that the sections Bi_2Te_3-Pr_3Te_4, PrTe-Bi, PrTe-PrBi are quasi-binary, while Bi_2Te_3-Pr are non-quasi-binary. The phase diagrams of the Bi_2Te_3-Pr_3Te_4, Bi-PrTe and PrTe-PrBi sections belong to the simple eutectic type with eutectic coordinates of 80 mol.% Bi_2Te_3 and 600 K; 94 mol.% Bi and 515 K; 45 mol.% PrBi and 1300 K, respectively. In the Bi_2Te_3-Pr_3Te_4 system based on Bi_2Te_3, a solubility range of up to 5 mol.% Pr_3Te_4 at 300 K was found.

Keywords: system, liquidus, quasi-binary, eutectic, diagram, crystallization, section, peritectic, phase.

1. Introduction

The study of chemical interactions in the Ln-Bi-Te (Ln-La,Ce, Sm,Tm,Er, Ho) system is of interest in connection with the use of rare earth elements (REE) in the switching of Bi_2Te_3-based thermocouples [1-4].

Bi_2Te_3 is characterized by a small band gap (0.15-0.3 eV), a relatively high thermoelectric voltage (up to 2.4 μV/K) and electrical conductivity (up to 15·104 Ω/cm), and low thermal conductivity (1.9 W/cm·K) . These properties can be used to apply solid solutions based on Bi_2Te_3 in thermoelectric energy converters.

Rare earth element tellurides are also semiconductors. [5-8].

It is known that Bi_2Te_3 crystallizes in rhombohedral tetradymite-type crystal systems and has a layered structure. Due to the weak Van der Waals forces between the layers of Bi_2Te_3, solid solutions based on it have low thermo mechanical strength and limited performance characteristics [9-14]. Their mechanical strength and thermoelectric properties can be improved by adding rare earth elements. Therefore, the study of the Pr-Bi-Te ternary system is relevant [15-19].

2. Experimental part

Pr-Bi-Te alloys were synthesized using the ampoule method in a single-temperature vertical furnace at 900-1450K (depending on the composition of the elements: Bi grade B-4, Pr metal Prt-0, Te grade Te-A2. Within a month after synthesis, the alloys were subjected to heat treatment. Samples with a praseodymium telluride content of 60 mol% and above were obtained in the form of sinter. They were repeatedly ground and converted into powder, which was then pressed under high pressure at p = 200 kQ/(mn^2) in the form of tablets. Alloys with a content of less than 60 mol% are compact, dark gray in color with a metallic luster. To achieve equilibrium, the alloys were subjected to homogenizing annealing in vacuum quartz ampoules at a temperature 50-70 K below the solidus for 750 hours.

The study was conducted using differential thermal analysis (DTA), high-temperature differential thermal analysis (HTDA), X-ray diffraction (XRD), microstructural analysis (MSA), and microhardness measurement. An etchant of the composition $0.1{\cdot}K_2Cr_2O_7{\cdot}H_2SO_4$+ H_2O (1:1) was used to study the microstructure of the alloys.

Thermal analysis was performed on an NTP-73 pyrometer and a Thermoscope-2. Accuracy ±5.0 (Pt-Pt/Rh thermocouples were used).

High-temperature thermal analysis (VTTA) was performed using a VTA-987 pyrometer (using W-W/Re thermocouples). X-ray phase analysis of the alloys was performed using a D2 Phaser and Bruker D8 diffractometer (CuK α-radiation).

Microstructural analysis of alloys (MSA) was performed on a MIM-7 microscope.

Microhardness of alloys was measured on a PMT-3 device at a load of 10.20 g. Taking into account the results of DTA, VDTA, MSA. RFA, microhardness measurements of alloys, diagrams of the state of the Pr-

Bi-Te ternary system sections were constructed: 1.Bi_2Te_3-Pr_3Te_4, 2. PrTe-Bi, 3. PrTe-PrBi, 4. Pr–Bi_2Te_3

It was established that sections 1-3 are quasi-binary and belong to the eutectic type.

3. Results and its discussion

To study the chemical interaction and construct a projection of the liquidus surface of the Pr-Bi-Te ternary system, the following sections were studied: Bi_2Te_3-Pr_3Te_4, PrTe-Bi, PrTe-PrBi. Bi_2Te_3-Pr.

Bi_2Te_3-Pr_3Te_4 section (Figure 1)

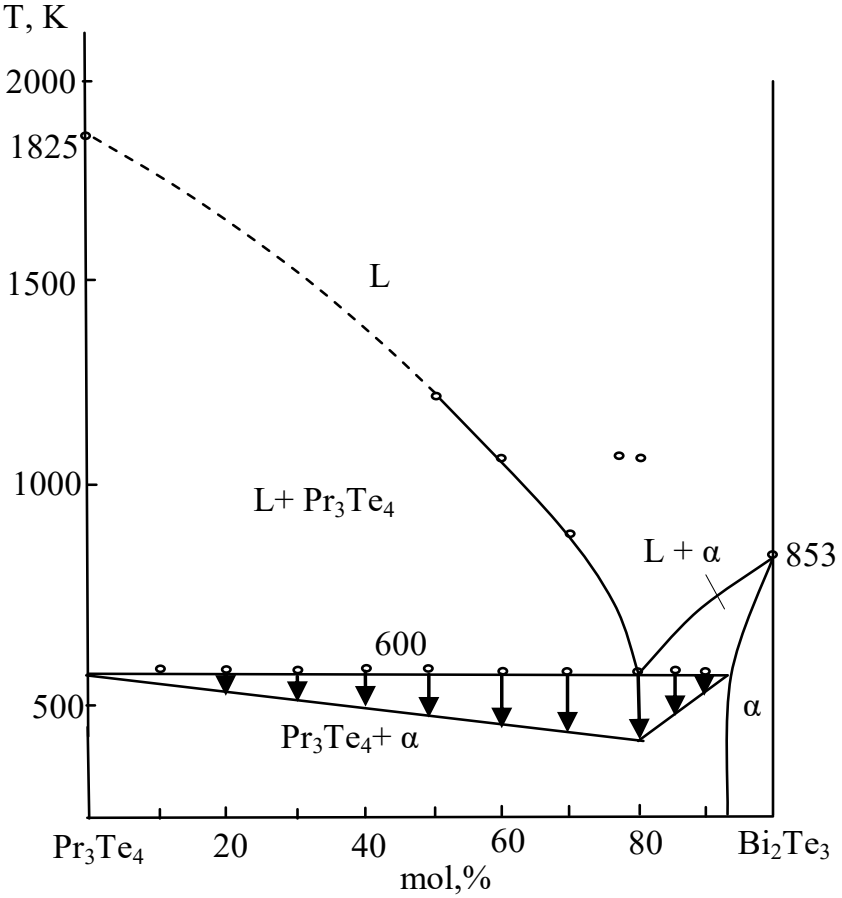


Figure 1. Phase diagrams of the Bi_2Te_3-Pr_3Te_4 system

As can be seen from the figure, the Bi_2Te_3-Pr_3Te_4 section is a quasi-binary section of the Pr-Bi-Te ternary system. The phase diagram of the system belongs to the simple eutectic type, with eutectic coordinates of 80 mol% Bi_2Te_3 and 600K. Also, in the Bi_2Te_3-based system, a limited region of solid solutions is formed, the boundaries of which at 300K are ~5 mol% Pr_3Te_4. At the eutectic temperature, this region expands to ~6 mol% Pr_3Te_4.

PrTe-Bi section (Figure 2).

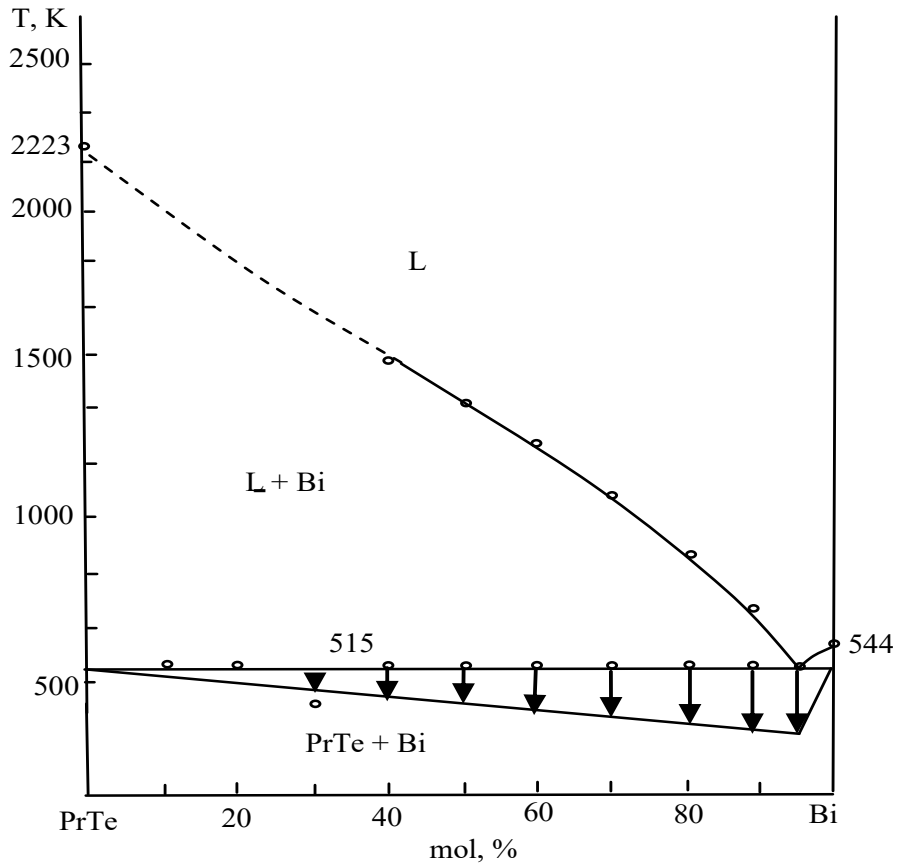


Figure 2. Phase diagrams of the PrTe-Bi system

The PrTe-Bi section is quasi-binary, the system state diagram corresponds to a simple eutectic type, and the eutectic crystallizes at 515K and 94 mol% Bi.

The PrTe-PrBi section (Figure 3).

This section is also a quasi-binary eutectic type with eutectic coordinates of 45 mol.% PrBi and 1300K..

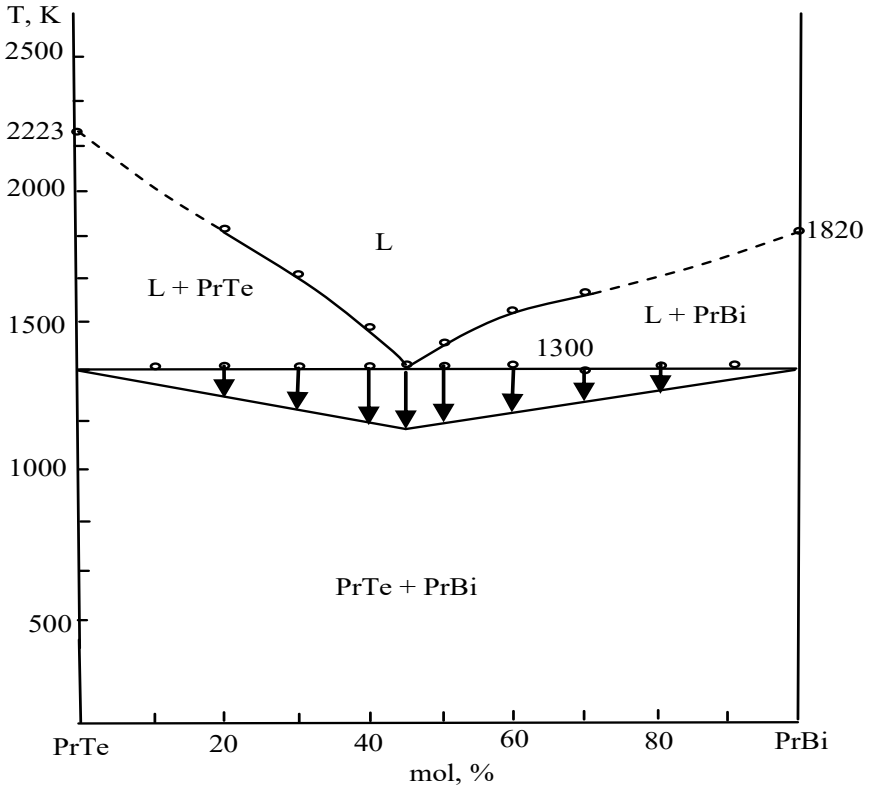


Figure 3. PrTe-PrBi system phase diagram

Pr–Bi_2Te_3 non-quasi-binary cross section (Figure 4).

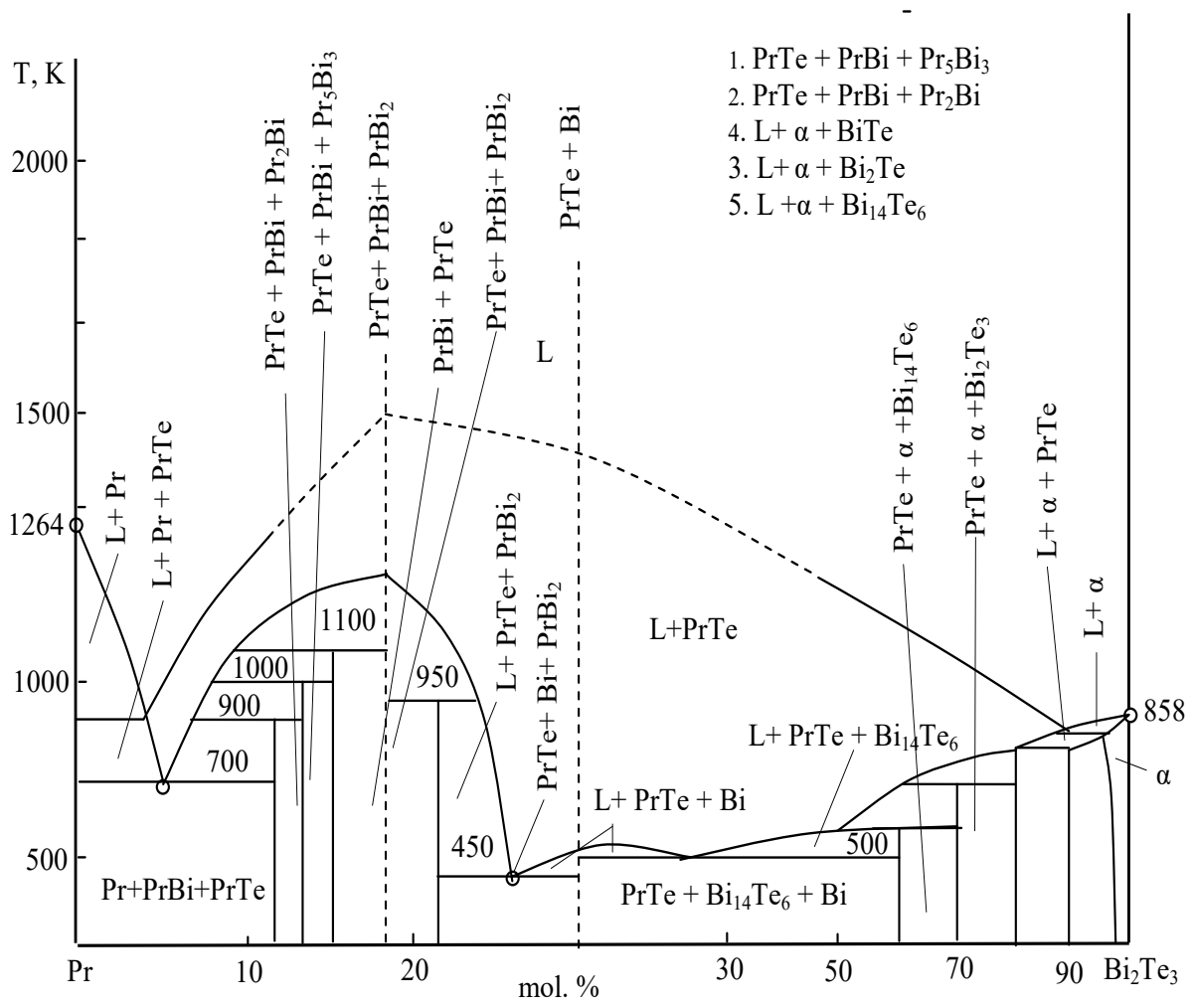


Figure 4. Phase diagram of the Pr–Bi_2Te_3 system

This section intersects three subordinate triangles: PrBi–PrTe–Bi, PrTe–Bi–Bi_2Te_3. The liquidus curve of this section consists of three parts, which correspond to the primary separations of α-solid solutions based on Bi_2Te_3, PrTe, and Pr. The isothermal lines at 700, 450, and 500 K reflect the triple eutectic equilibria in the corresponding subordinate triple systems that intersect the Bi_2Te_3-Pr section. Seven peritectic reactions occur in the system:

1. L + PrTe → Pr_4Te_7 + PrTe (1100K)
2. L + Pr_4Te_7 → $PrTe_{1,9}$ + PrTe (1000K)
3. L + $PrTe_{1,9}$ → Pr_2Te_5 + PrTe (900K)
4. L + PrBi → $PrBi_2$ + PrTe (950K)
5. L + α → BiTe + PrTe (750K)
6. L + BiTe → Bi_2Te + PrTe (700K)
7. L + Bi_2Te → $Pr_{14}Te_6$ + PrTe (600K)

4. Conclusions

It was found that the sections Bi_2Te_3-Pr_3Te_4, PrTe-Bi, PrTe-PrBi are quasi-binary, while Bi2Te3-Pr are non-quasi-binary. The phase diagrams of the sections Bi_2Te_3-Pr_3Te_4, PrTe-Bi and PrTe-PrBi belong to the simple eutectic type with eutectic coordinates of 80 mol.% Bi_2Te_3 and 600 K; 94 mol.% Bi and 515 K; 45 mol.% PrBi and 1300 K, respectively. In the Bi_2Te_3-Pr_3Te_4 system based on Bi_2Te_3, a solubility range of up to 5 mol% Pr_3Te_4 at 300 K was observed.

On average, limited solid solution regions (~3–5 mol.% at 300 K) were observed in Bi_2Te_3-based systems. These results provide insight into phase equilibria in ternary systems containing rare earth elements and can be used to develop promising thermoelectric materials.

References

1. Abrikosov, N.Kh.; Bankina, V.F. et al. *Semiconductor chalcogenides and alloys based on them.* Nauka, Moscow; 1975, p.220

2. Yarembash, E.I.; Eliseev, A.A. *Chalcogenides of rare earth elements*, Nauka, Moscow; 1975; p. 275.

3. Sadygov, F.M.; Jafarova, E.K.; Babanly M.B. Character of phase formation in Sb_2Se_3(Bi_2Se_3)-TmSe systems. *Zh. Inorg. Chem*. 2002, 47, 1713.

4. Sadygov, F.M.; Ilyasly, T.M.; Nasibova, L.E.; Aliev I.I. Physico-chemical study of the Sb_2Se_3-Nd_2Se_3 system. *Zh. Inorg. Chem*. 2013, 58, 1253-1256.

5. Sadygov, F.M.; Mamedova, S.G.; Babanly, M.B.; Ilyasly T.M. Phase equilibria in the Ce-Sb-Se system along the Sb_2Se_3-Ce_2Se_3 section. *Zh. Inorg. Chem*. 2001, 46, 1382-1383.

6. Ilyasly T.M., Abbasova R.F., Veysova S.M., Gahramanova G.G.; Glass and phase formation in Sm

– As – Se and Eu – As – Se systems New Materials, Compounds and Applications Vol.7, No.3, 2023, pp.210-218

7. Snyder, G.J.; Toberer, E. Complex Thermoelectric Materials. *Nat. Mater.* 2008*,* 7, 105-114.

8. Sadygov, F.M.; Ilyasly, T.M.; Ganbarova, G.T.; Zlomanov, V.P.; Aliev I.I. Physical and chemical study of the Sb_2Se_3-Nd_2Se_3system. *Inorg. Mater.* 2017, 53, 681-685.

9. Shurova, M.A.; Andreev, O.V.; Kharitontsev V.B. Phase equilibria in the Bi_2Se_3-Sm_2Se_3 system. *Social, economic, and law research*, 2014, 5, 113-121.

10. Kost, M.E.; Shilov, A.A.; Mikheeva V.I. *Chemistry of Rare Earth Elements: Hydrides, Borides, Carbides, Phosphides, Pnictides, Chalcogenides,* Nauka, Moscow; 1983; p. 272.

11. Rustamov, P.G.; Aliev O.M.; Eynullaev A.V. *Chalcolanthanates of rare earth elements,* M: science; Baku; 1988; p.284 .

12. *Ph.D. Thesis:* Sadygov, F.M. *Physico-chemical basis for the production of chalcostibines and chalcobismuthites of rare earth elements and materials based on them,* Baku State University, Baku; 1993; p.48

13. Sadygov, F.M.; Ilyasly, T.M.; Gambarova G.T. Phase equilibria in the Bi_2Se_3 – Nd_3Se system and electrical properties of the resulting phases. *Adv. in mod. Nat. sci.* 2-16, 4, 53-56.

14. Sadygov, F.M.; Bakhtiyarov, I.B.; Heydarova E.A . Liquidus of the ternary system La-Bi-Te. *Inorg.. Mater.* 1982, 23, 1992-1988.

15. Geydarova, E.A.; Rustamov, P.G.; Aliev I.Sh. Study of interaction in the La_2Te_3 – Sb_2Te_3 system, 1982, 27, 1880-1882.

16. Goltsman, B.M.; Kudinov, V.A.; Smirnov I.A. *Semiconductor thermoelectric materials based on Bi_2Te_3,* Nauka, Moskow, 1972, p. 320.

17. Ganbarova, G.; Sadigov, F.; Ismayilov, Z.; Mirzayeva, R.; Hasanova Z. Phase formation in the trinary system Nd-Bi-Te according to the section Bi_2Se_3-Nd_2Se_3, *Jour. of Chem. and Mat. Scien,* 2024, 1(4), 34-39

18. Imamalieva, S.Z,; Mashadiyeva, L.F,; Zlomanov, V.P.; Babanly M.B. Phase equilibria in the Tl_2Te-YbTe-Te system. *Inorg. Mater..* 2015, 51, 237-1242.

19. Hasan, Ali S.; Ahmed Ehsan Jassem, Ahmed Hashim, Najah M. L. Al Maimuri, Hussein M. Khalid, Mohammed H. Abbas, Modelling and ameliorating the features of (PS-SiO2-MnO2) multifunctional films for futuristic optoelectronics applications, *Bull. Chem. Soc. Ethiop.* 2026, 40(5), 1043-1056.

SECTION OF EARTH SCIENCES

IMPACTS OF CLIMATE CHANGE ON LOCAL ECOSYSTEMS: AN ANALYSIS FROM AN ECOTOURISM PERSPECTIVE

Asadova G.
Azerbaijan Technological Universty
Yusifova M.
Azerbaijan Technological Universty
Alakbarova Z.
Ganja State University
Jafarova H.
Azerbaijan Technological Universty
Ismayilov N.
Azerbaijan Technological Universty
Khalilov S.
Azerbaijan Technological Universty, Ganja State University
DOI: 10.5281/zenodo.21934740

Abstract

Climate change acts as a primary catalyst altering the structural and functional integrity of local ecosystems, thereby posing significant challenges to the sustainability of the ecotourism sector. This study provides a comparative analysis of historical climate baselines against contemporary climatic shifts—such as rising temperatures, altered precipitation regimes, and accelerated glacial retreat—to evaluate their direct consequences on ecotourism dynamics. By examining mountainous, forest, and wetland ecosystems, the analysis illustrates how the loss of seasonal stability, increased natural hazards (e.g., landslides, floods, and forest fires), and habitat degradation directly compromise biodiversity-based tourism, including bird watching and wilderness hiking. The findings indicate that traditional, static tourism planning is no longer viable. Ultimately, the study highlights the critical necessity of transitioning toward dynamic carrying capacity management and implementing adaptive ecological framework models to preserve local natural capital while sustaining regional ecotourism viability.

Keywords: Climate Change, Local Ecosystems, Ecotourism, Comparative Analysis, Ecological Resilience, Adaptive Management, Carrying Capacity.

When evaluating the impact of climate change on local ecosystems from an ecotourism perspective, it is essential to conduct a comparative analysis of historical climate norms against modern climate scenarios. In comparison to previous decades, the climate sensitivity of local ecosystems has escalated dramatically in the modern era, directly reshaping the structure of the ecotourism sector. While ecotourism activities in the past relied on stable seasonal climate indicators and predictable natural phenomena, anthropogenic climate change has now completely disrupted this stability.

Comparative analysis reveals that in the late 20th century, the presence of stable snow cover in mountainous ecosystems naturally supported winter and spring ecotourism, whereas today, rapid glacial retreat and rising temperatures trigger landslides and flood risks in alpine ecosystems, thereby restricting safe tourism routes.

Similarly, while the humid and lush forest cover of earlier years created an attractive microclimate for tourists, contemporary long-term droughts diminish the aesthetic value of forest landscapes and escalate forest fire risks, putting the safety of recreational areas in jeopardy.

Analyzing from a biodiversity standpoint, while wetland and lake ecosystems with stable water regimes formerly provided ideal conditions for migratory bird watching, the current depletion of water resources and shallowing of lakes force these sensitive species to alter their migration routes, ultimately leading to the decline of this niche tourism sector.

Ultimately, whereas ecotourism planning in the past was solely based on managing seasonal tourist flows, today's reality makes the dynamic calculation of carrying capacity—evaluating ecosystem resilience against both anthropogenic and climatic stress—and the implementation of ecological framework models an inevitable necessity.

Decadal Comparative Analysis of Climate Change Impacts on Ecosystems and Ecotourism

Era / Years	Climate Indicators (Observed/Projected)	Ecological Ecosystem Shifts	Direct Impacts on the Ecotourism Sector
1970–1990s *(Historical Baseline & Stability)*	• Stable four-season cycle with predictable precipitation patterns. • Reliable winter snow cover in mountainous regions (lasting 4–5 months).	• High ecological equilibrium in forest and aquatic ecosystems. • Abundant water bodies providing stable habitats for migratory birds and local fauna.	• Highly predictable winter and summer tourism seasons. • Safe, well-defined hiking and trekking trails with minimal hazard risks. • Flourishing birdwatching and wildlife viewing based on rich biodive

2000–2015 *(Emergence of Vulnerability)*
• Gradual rise in regional temperature by 0.5°C to 0.8°C.
• Increasing frequency of extreme weather anomalies (unseasonal droughts, flash floods).
• Initial retreat and thinning of alpine glaciers.
2020–2026 *(Modern Stress Era)*
• Temperature anomaly exceeding 1.2°C.
• High volatility in seasonal rainfall and severe, prolonged summer droughts.
• Rapid degradation of high-altitude zones; increased land degradation and landslides.
• Extreme shallowing and fragmentation of fragile wetland habitats.
• Shifts and narrowing of ecological niches for endemic flora.
• Shift of summer ecotourism peaks to shoulder seasons (spring and autumn) due to extreme heat.
• Decline in the aesthetic value of landscapes due to dry riverbeds and yellowed vegetation.
• Maximum security risks on mountain routes (rockfalls, landslides, and flash floods).
• Seasonal drops in water levels of wetlands and shallow lakes.
• Arid zones beginning to encroach on forest boundaries.
• Shortening of the winter sports and recreation season due to unreliable snow cover.
• Temporary closures of hiking routes in spring due to sudden flood risks.
• Increased friction in tourism management due to less predictable weather.

2030–2050 *(Projected Future)*
• Projected warming exceeding 2.0°C.
• Expected 20% to 25% decline in overall freshwater resources.
• Potential near-total loss of lower-altitude mountain glaciers.
• Upward migration of tree lines to alpine zones.
• Permanent disruption of migratory flyways and displacement of local wildlife.
• Obsolescence of classic, historically popular ecotourism routes.
• Mandatory implementation of strict, reduced "Carrying Capacity" limits to prevent habitat collapse.
• Complete reliance on regenerative tourism, green infrastructure, and active habitat restoration.

Here is the professional English translation of the supplementary academic and practical data, structured to elevate the scientific depth and practical value of your research paper:

1. The Concept of "Microclimatic Refugia"

As global temperatures rise, a critical ecological concept is gaining traction in sustainable tourism planning: **Microclimatic Refugia**.

- **Definition:** These are localized areas (e.g., deep canyons, north-facing slopes, dense old-growth forest valleys) that, owing to their unique topography and canopy cover, remain significantly cooler and more humid than the surrounding regional climate.
- **Implications for Ecotourism:** Future trail mapping must prioritize these refugia. Because climate-sensitive endemic species (such as rare alpine flora or humidity-dependent amphibians) will increasingly retreat to these zones to survive, they will serve as the primary remaining visual hotspots for biodiversity-focused tourists.

"Solastalgia" (Eco-Anxiety) and the Psychological Dimension of Ecotourism

Integrating this contemporary sociological term adds a humanistic and psychological dimension to your analysis:

- **Solastalgia:** A term coined to describe the specific form of mental or existential distress caused by the environmental degradation of one's home or beloved natural landscapes due to climate change.
- **Implications for Ecotourism:** Modern ecotourists no longer just seek leisure; many experience profound ecological grief when witnessing degraded ecosystems (e.g., dried-out waterfalls or dead forests). Consequently, operators must transition toward **Regenerative Tourism** models, incorporating educational debriefings, citizen science, and active restoration activities (such as tree planting) to help tourists process this anxiety productively.

Region-Specific Case Studies (Azerbaijan)

Utilizing local, concrete examples significantly strengthens the regional scientific credibility of your paper:

Case Study A: Kizilagaj National Park and Migratory Flyways

- **The Climate Driver:** Falling water levels in the Caspian Sea combined with extreme evaporation rates in the Kura-Aras Lowland are shrinking and salinizing vital coastal wetland habitats.
- **Ecotourism Impact:** A decline in the abundance and diversity of migratory birds, leading to a direct drop in international birdwatching tourism during the autumn and winter seasons.
- **Adaptive Mitigation:** Developing artificial wetland water-management systems and constructing low-impact, camouflaged birdwatching hides to ensure tourists do not stress the remaining avian populations.

Case Study B: Hiking Trail Safety in the Greater Caucasus (Shahdag National Park)

- **The Climate Driver:** Melting glaciers coupled with sudden, intense summer downpours trigger frequent flash floods and mudslides (e.g., in the Guba-Gusar and Sheki-Zaqatala sectors).
- **Ecotourism Impact:** Popular high-altitude trekking routes are becoming highly unpredictable and dangerous during peak summer months.
- **Adaptive Mitigation:** Integrating real-time **Early Warning Systems** (EWS) into national park mobile apps and requiring mandatory climate-risk safety certifications for all local mountain guides.

The "Carbon Footprint" Ecotourism Paradox. One of the most compelling intellectual arguments to include in your paper is the inherent paradox of ecotourism:

The Paradox: While ecotourists travel with the intent of appreciating and protecting nature, the carbon emissions generated by their long-haul travel (especially international flights) contribute directly to the global warming that threatens those very destinations.

Proposed Solution: Ecotourism destinations must implement localized **Carbon Offsetting** programs. Upon arrival, visitors can pay a calculated "ecological tax" integrated into park entry fees, which directly funds local soil restoration and reforestation initiatives in which they can physically participate.

Modern Methodology: Limits of Acceptable Change (LAC). For the methodological framework of your paper, reference this modern planning model:

- Instead of relying on the outdated, static concept of "Carrying Capacity" (which merely counts the number of visitors), modern sustainable planning utilizes the **Limits of Acceptable Change (LAC)** framework.
- LAC defines the specific, measurable environmental conditions (e.g., soil compaction rates, water quality, wildlife nesting distances) that must be maintained despite climate and tourist pressures, dynamically adjusting visitor numbers to ensure these ecological thresholds are never crossed.

References

1. Iskandarova T., Aliyeva Ye., Asadova G., Mahmudov S., Amiraslanov F. No 162 (2025). a. pp. 8-13. Monitoring the impact of climate change on local ecosystems. DOI: 10.5281/zenodo.15621839 The-scientific-heritage-No-162-162-2025.pdf

2. Алиева Е.Д., Асадова Г.А., Исмаилова А.Б. ”Оцениван эко-географических условий земель Азербайджана”. Международный научный журнал «ВЕСТНИК НАУКИ» № 4 (85) Том 3. АПРЕЛЬ 2025 г. 1123 – 1127 вестник-науки.рф/archiv/journal-4 -85 - 3.pdf#page=1123. journal-4-85-3.pdf

3. Elshad Mammadov, G. Asadova, İrshad Abbasov (ganja, azerbaijan) “İnvestigation of the impact of climate change on the area changes of water basins in Azerbaijan using GİS (geographic information systems)”. National academy of scientific and innovative research «science and education: modern time» (issue 13,2025). pp. 196-199. Просмотр «2025: TOM 13, SCIENCE AND EDUCATION MODERN TIME»

4. Gahramanova S., Asadova G., Hasanov V., “Climate change as a determinant of human health: emerging challenges and adaptation strategies”. German International Journal of Modern Science №117, 2025. pp. 15-17. DOI: 10.5281/zenodo.17865024. Deutsche-internationale-Zeitschrift-für-zeitgenössische-Wissenschaft-№117-2025.pdf

5. Gurbanova S., Asadova G., Mammadova Kh., Talibzade Z., Bagirova A. A. “Geospatial analysis of climate change–induced transformations in water bodies”. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft №118 2025. pp. 18-21. DOI: 10.5281/zenodo.18003098. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft №118 2025.pdf - Яндекс Документы

SECTION OF HUMANITIES AND PHILOLOGY

THE IMPORTANCE OF PLANNING THE ENGLISH LESSONS DURING THE STAGES

Sarigul S.
Azerbaijan State Pedagogical University, Foreign Languages Center
Lecturer
ORCID NO: 0009-0002-9474-9567
DOI: 10.5281/zenodo.21934760

Abstract

Each lesson is unique and consists of different stages. Lessons should be planned in advance and divided into stages. These goals can be different for each lesson, depending on the topic. A well-planned lesson can lead to very good results. Taking into account the skills and interests of students when drawing up a plan is one of the most important factors.

Deductive and inductive methods are used in teaching grammar. According to this method, about 20 minutes out of 90 minutes are completely covered with grammatical items. The article shows that when passing any time, it should be compared with the native language. The theoretical stage is also explained with a translation of grammar. At that stage, it is translated into the native language and conveyed to the students. The stage after grammar is the stage of inquiry of the old topic. The next stage is the stage of delivering a new lesson to the students. It can be said that grammatical material is reinforced by using it in more sentences and on texts.

In the final stage, the teacher tries to convey the goal he has set to the students. Therefore, it is advisable to use stages in the training process.

Keywords: plan, stage, main, lesson.

The best teachers are those who think carefully about what they are going to do their classes and who plan how they are going to organize the teaching and learning. (geremy Harner).

We know that every lesson must be unique and must be made up different stages. Lessons can focus on grammar vocabulary, readily a writing. The may contain listening and speaking activities and concentrate on introducing new language items or on revision. The actual content of any lesson will depend on what the teacher aims to achieve during the lesson, the students and the teaching situation. However there are some ideas that can be considered for every lesson. Students who are interested in, involved in and enjoy what they are studying tent to mare better progress and learn faster. As teachers, it is important then to provide students with lessons that are not only well structured but which are also interesting and enjoyable. Careful thought and preparation will help to achieve this.

During the lesson it is important to engage the students. This means getting the students interested in the subject, in the class and in the language point and hopefully enjoying what they are doing. But why is this important? After all, you may in any lesson students usually need something to study. In an English teaching lesson there needs to be some language focus for tie class.

Students med to be introduced systematically to the way that English to put together. The study element of a lesson could be a focus on any aspect of the language, such as grammar or vocabulary and pronunciation. A study stage does not have to be new language. It could also cover version and extension of previously taught material, feel that students come to university to learn not to be entertained.

Simply telling students about the language is not usually enough to help them to lean it.

In order for students to be able to develop their use of English, they need to be given the chance to produce it. In an activate stage the students are given tasks, normally writing and or speaking actives which require students to use not only the language they are studying that day, but also other language that they have learnt.

Here are some reasons why its important to let students have this kind of practice:

a) It gives students the chance to rehearse English, as if they were doing it in real world but in the safe environment of the classroom.

b) Some theories of language learning suggest that by giving students this kind of practice, it helps them to “switch” language they have been studying, into language which they can use instinctively without having to think about it.

c) These kind of actives are often fun for the students. As the have mentioned before, providing an enjoyable classroom experience for students helps the teaching process.

d) This kind of activity, because it does not restrict for students to using only a particular area of language, is an effective way for both students and the teacher to assess how well the class is progressing.

e) Providing suitable tasks whish the students can achieve using lots of different language has a positive motivational effect on students. Motivated students tend to learn better.

Engage, study and activate – three important considerations for any lesson. Every activity, every exercise, every part of a lesson should fit into one of these categories. Although E.S.A. is a guide to what should go into a lesson, it is not necessarily a guide as to what order actives. In other words, the activate stage helps the teacher to decide we content of the study stage.

What in a lesson plan?

A lesson plan is a framework for a lesson. If you imagine that a lesson is like a journey, then the lesson plan is a map.

It shows where you start, where you finish and the raise to take to get there. Lesson plans are the product of teachers' thoughts about their classes, what they hope to achieve and how they hope to achieve it. They are usually though not always, in written form.

Without some kind of planning, a lesson could be just as chaotic and could have the students with no clear idea of what they were doing or why. This kind of and uncertainty is not good for effective learning or class discipline. One of the most important reasons to plan is that the teacher needs to identify his or her aims for the lesson. Teachers need to know, what to know, what is they hope to achieve in the class, what they want the students to be able to do at the end of the lesson that they couldn't do before.

We are now going to put the above points into practice. For our imagined lesson we'll take the topic of the use of the prepositions "for" and "since" with the prefect aspect. We'll consider the following topics

a) aims and concepts;
b) contexts and marker sentences;
c) starting a lesson;
d) presenting new language;
e) freer (less controlled) practice;
f) finishing the lesson.

Aims and concepts

for an task we are assuming that the students have recently been introduced to the structure and use of the present prefect. It's important to have clear and realistic aims for your lessons.

Aim. To present and provide of the use of "for" and "since" with the prefect (present). It is important to identify the concept of your target language. Many language items are used in different ways with different concepts. For example the present continuous aspect. The present continuous can be used to describe an action that is in progress at the moment speaking, for example, I'm working on my computer at the moment.

However, it can also be used to refer to a future planned arrangement, such as, I'm seeing my mother next weekend.

Although the language point in the same, the concepts are different. It can be confusing for students if different concepts are not clearly identified or are mixed up during a presentation. Every planned activity and every marker sentence can be referred back to the aim, to check that it does actually fit the concept you are trying to teach. It is essential to make sure that the exercises and activities you decide to do actually fir your aims contexts and marker sentences.

Once you have established your concept you need to consider actual contexts or situations where the language is used for our lesson we need to think of a situation when a native speaker would use the present perfect with "for" and "since". It is used when people talk about have long they have had their jobs or possessions. Then you need to think of model or marker sentences that are good examples of the contextualized target language. Marker sentences are used in the Study stage when presetting new language.

Starting a lesson

Every lesson has a beginning. And the beginning of a book or a film, it does not interest the reader, writer or in our case, the student, then it may not be successful.

The teacher should try to engage the students from the very start of the lesson. A good way of doing this is through activities called warmers or ice breakers. Warmers can often be adapted to provide version, giving the students and opportunity to use previously studied language.

Presently new language

When planning to present a new language item the teacher needs to be sure of the following points: How the language item is made – what grammatical structure of the item is, how it is pronounced and written how negatives and questions are formed it appropriate.

Concept – what the form actually means Concept - when the form is actually used

Most course books have these but, here are a few more of the materials that are commonly used to introduce new language.

Video types Audio types Newspaper songs Pictures

Stories

Controlled practice

Once new language has been introduced to the students, they need to have opportunity to try it out for themselves. To become familiar with the form and get their language and brains around it, controlled practice activities can be used.

Freer practice

Controlled practice activities develop students' accuracy. Here are a new ideas

Discussions – on subject of interest to the class.

Writing actives, such as keeping a diary or writing letters and post cards.

Projects and tasks – a class newspaper for example. Finishing the lesson.

Any lesson is only as long as the university timetable allows. When planning teachers obviously have to consider the amount of time they have with their class and stage their lessons accordingly. A longer lesson may have more than one teaching sapience… shorter lessons may not, for example, contain a study stage, but may follow on from the study stage of previous lesson. But one thing is sure, every lesson does have to finish and a good ending of a lesson is as important as a good start. It is important when ending a lesson that the students have some sense of achievement. It is also common for teachers to finish the session with activities similar to warmers. The aim here is not to warm up the students but to around off the lesson with and enjoyable game or activity. As with warmer is the activity may or may not be connected with the focus of lesson.

References

1. Action plen for teachers, Callum Robertson, Richard Acklam.
2. BBC word learning bbc.co.uk

SECTION OF SOCIAL AND ECONOMIC SCIENCES

THE EVOLUTION OF VISUAL STORYTELLING AND DIGITAL AUDIENCE EXPERIENCES

Ahmadov E.
Videographer, filmmaker, content creator
DOI: 10.5281/zenodo.21934778

Abstract

Visual storytelling has undergone a profound transformation in the digital era, driven by rapid advancements in communication technologies, social media platforms, streaming services, and interactive media. Traditional cinematic narratives, once confined to theaters and television screens, have evolved into dynamic, multi-platform experiences that encourage audience interaction, participation, and content creation. This study examines the evolution of visual storytelling and its influence on digital audience experiences by exploring how emerging technologies and digital communication channels have redefined narrative production, distribution, and consumption. The paper investigates the growing role of social media platforms, streaming services, virtual reality (VR), augmented reality (AR), artificial intelligence (AI), and immersive digital environments in creating personalized and interactive storytelling experiences. Particular attention is given to the transition from passive spectatorship to participatory culture, where audiences actively engage through user-generated content, online discussions, fan communities, live interactions, and transmedia storytelling. The study further analyzes the impact of recommendation algorithms, digital marketing strategies, and influencer-generated content on audience engagement, emotional connection, and media consumption behavior. While digital technologies have significantly expanded creative possibilities and democratized content creation, they also present challenges related to information overload, algorithmic bias, fragmented audience attention, copyright protection, and digital ethics. Drawing upon recent literature in media studies, digital communication, and film research, the paper concludes that the convergence of visual storytelling and digital technologies has fundamentally reshaped audience experiences by fostering greater interactivity, accessibility, and personalization. Future developments in artificial intelligence, immersive media, and virtual environments are expected to further transform storytelling practices, creating increasingly adaptive, collaborative, and audience-centered narrative ecosystems that redefine the relationship between creators and viewers in the evolving digital entertainment landscape.

Keywords: Visual Storytelling, Digital Media, Audience Experience, Social Media, Streaming Platforms, Artificial Intelligence, Virtual Reality, Augmented Reality, Transmedia Storytelling, Audience Engagement.

Introduction

Visual storytelling has long been one of the most influential forms of human communication, enabling societies to share knowledge, preserve cultural traditions, and evoke emotional responses through images, symbols, and narratives. From prehistoric cave paintings and theatrical performances to cinema and television, storytelling has continually evolved alongside technological progress. In the twenty-first century, rapid advancements in digital technologies have fundamentally transformed the ways stories are created, distributed, and experienced. Social media platforms, streaming services, artificial intelligence (AI), virtual reality (VR), augmented reality (AR), and interactive digital environments have introduced innovative storytelling formats that extend beyond traditional cinematic experiences. As a result, audiences are no longer passive viewers but active participants who engage with narratives across multiple digital platforms.

The convergence of digital media and visual storytelling has reshaped the entertainment industry by enabling creators to produce immersive, personalized, and interactive experiences. Digital audiences expect immediate access to content, opportunities for participation, and meaningful engagement through online communities. Consequently, filmmakers, content creators, and media organizations increasingly integrate digital technologies into storytelling strategies to strengthen audience relationships and maintain competitiveness in a rapidly evolving media landscape. Understanding the evolution of visual storytelling and its impact on audience experiences is therefore essential for evaluating the future of digital communication and entertainment [3, p.64].

Historical Evolution of Visual Storytelling

Visual storytelling has developed through several significant stages throughout history. Early civilizations relied on paintings, sculptures, and symbolic imagery to communicate cultural values, historical events, and religious beliefs. As literacy expanded, illustrated manuscripts and printed publications combined visual elements with written narratives, increasing the accessibility of storytelling.

The invention of photography during the nineteenth century introduced new possibilities for documenting reality through visual representation. Shortly thereafter, motion pictures revolutionized storytelling by combining moving images, sound, and narrative structure into a powerful artistic medium. Throughout the twentieth century, cinema became one of the dominant forms of mass communication, influencing public opinion, culture, education, and entertainment worldwide [4].

Television further expanded audience access to visual narratives by bringing cinematic experiences directly into homes. However, communication remained largely one-directional, with audiences consuming professionally produced content without actively participating in the storytelling process. The emergence of the

internet fundamentally changed this relationship by enabling digital distribution, online interaction, and collaborative content creation.

Today, digital storytelling extends across numerous interconnected platforms, including streaming services, social media applications, gaming environments, podcasts, and mobile devices. Rather than existing within a single medium, narratives increasingly evolve across multiple channels, creating richer and more immersive audience experiences [1].

Digital Transformation of Visual Storytelling

The digital revolution has dramatically altered both the production and consumption of visual narratives. Advances in computer graphics, digital cinematography, animation, cloud computing, and artificial intelligence have expanded creative possibilities while reducing production costs. Streaming platforms such as Netflix, Disney+, Amazon Prime Video, Apple TV+, and HBO Max have transformed content distribution by providing audiences with instant access to extensive libraries of films and television series. Unlike traditional broadcasting schedules, streaming services allow viewers to watch content whenever and wherever they choose, increasing convenience and personalization.

Social media platforms have simultaneously become important storytelling environments. YouTube enables creators to produce documentaries, educational videos, and cinematic productions for global audiences. Instagram emphasizes visual narratives through photographs, stories, and short-form videos, while TikTok has popularized concise, highly engaging storytelling formats capable of reaching millions of viewers within hours. Artificial intelligence has introduced new possibilities for script development, content recommendation, audience analysis, and personalized storytelling. AI-powered recommendation algorithms analyze viewing histories and user preferences to suggest content that aligns with individual interests, increasing audience engagement and satisfaction. These technological developments have transformed storytelling into an adaptive, data-driven process that continuously evolves according to audience behavior and digital interaction [2].

Interactive and Immersive Audience Experiences

One of the most significant characteristics of digital storytelling is its emphasis on audience participation. Modern audiences no longer consume stories passively but actively contribute to narrative development through comments, reviews, discussions, social sharing, and user-generated content. Participatory culture has become particularly evident within online fan communities. Viewers create reaction videos, fan art, podcasts, analytical essays, memes, and alternative story interpretations that expand narrative universes beyond official productions. These collaborative activities strengthen emotional attachment while extending the commercial lifespan of films and television series.

Virtual Reality represents another major innovation in visual storytelling. VR enables audiences to enter immersive digital environments where they experience narratives from a first-person perspective. Rather than observing fictional worlds from outside, users actively explore virtual spaces, interact with characters, and influence storytelling progression. Similarly, Augmented Reality overlays digital information onto physical environments, creating hybrid experiences that merge reality with fictional narratives. Museums, educational institutions, tourism organizations, and entertainment companies increasingly utilize AR technologies to deliver engaging visual experiences that combine education and entertainment. Interactive storytelling also appears in video games, where players influence narrative outcomes through individual decisions. This approach encourages deeper emotional investment because audiences become active participants rather than passive observers [7, p.93].

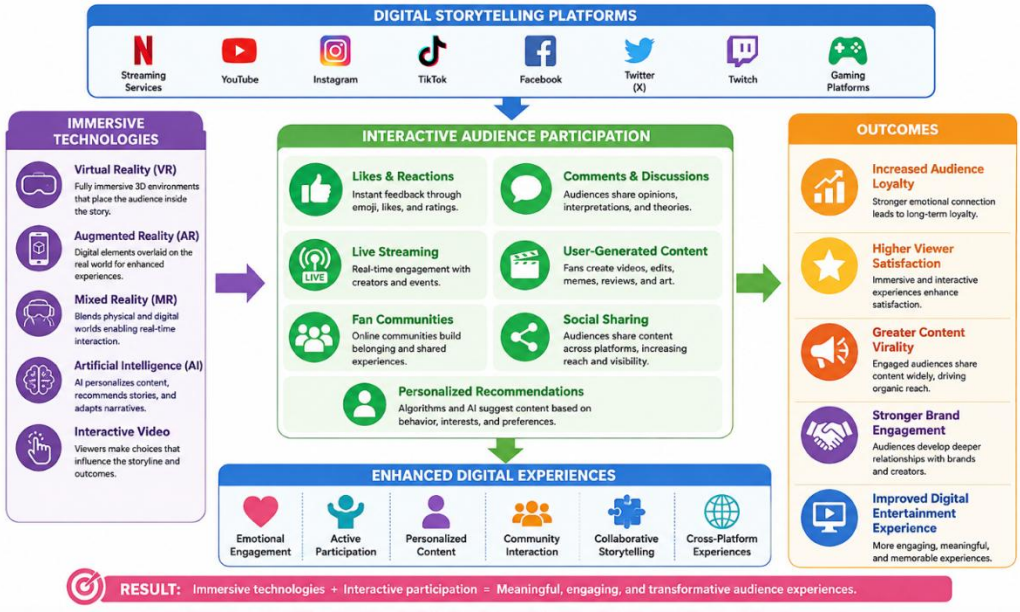

DIGITAL STORYTELLING PLATFORMS
Streaming Services
YouTube
Instagram
TikTok
Facebook
Twitter (X)
Twitch
Gaming Platforms
IMMERSIVE TECHNOLOGIES
Virtual Reality (VR)
Fully immersive 3D environments that place the audience inside the story.
Augmented Reality (AR)
Digital elements overlaid on the real world for enhanced experiences.
Mixed Reality (MR)
Blends physical and digital worlds enabling real-time interaction.
Artificial Intelligence (AI)
AI personalizes content, recommends stories, and adapts narratives.
Interactive Video
Viewers make choices that influence the storyline and outcomes.
INTERACTIVE AUDIENCE PARTICIPATION
Likes & Reactions
Instant feedback through emoji, likes, and ratings.
Comments & Discussions
Audiences share opinions, interpretations, and theories.
Live Streaming
Real-time engagement with creators and events.
User-Generated Content
Fans create videos, edits, memes, reviews, and art.
Fan Communities
Online communities build belonging and shared experiences.
Social Sharing
Audiences share content across platforms, increasing reach and visibility.
Personalized Recommendations
Algorithms and AI suggest content based on behavior, interests, and preferences.
ENHANCED DIGITAL EXPERIENCES
Emotional Engagement
Active Participation
Personalized Content
Community Interaction
Collaborative Storytelling
Cross-Platform Experiences
OUTCOMES
Increased Audience Loyalty
Stronger emotional connection leads to long-term loyalty.
Higher Viewer Satisfaction
Immersive and interactive experiences enhance satisfaction.
Greater Content Virality
Engaged audiences share content widely, driving organic reach.
Stronger Brand Engagement
Audiences develop deeper relationships with brands and creators.
Improved Digital Entertainment Experience
More engaging, meaningful, and memorable experiences.
RESULT: Immersive technologies + Interactive participation = Meaningful, engaging, and transformative audience experiences.

Figure 1. Interactive and Immersive Audience Experiences in the Digital Media Ecosystem

Social Media and Audience Engagement

Social media has fundamentally transformed audience engagement by creating direct communication between creators and consumers. Digital platforms facilitate continuous interaction throughout every stage of content consumption, including pre-release marketing, live viewing experiences, and post-viewing discussions. Content creators utilize social media to publish trailers, behind-the-scenes footage, interviews, production updates, and promotional campaigns that generate anticipation before official releases. Audiences respond immediately through comments, likes, shares, and discussions that amplify promotional reach organically.

Influencer marketing has further strengthened audience engagement. Digital creators recommend films, analyze narratives, conduct interviews, and produce review videos that influence consumer decisions. Because audiences often perceive influencers as authentic and trustworthy, their recommendations frequently carry greater persuasive power than traditional advertising. Electronic word-of-mouth has become another major determinant of audience behavior. Online reviews, social recommendations, and audience ratings significantly influence viewing decisions, contributing directly to commercial success or failure [6].

Furthermore, social media enables real-time communication among global audiences, allowing viewers from different cultural backgrounds to exchange interpretations and discuss cinematic experiences collectively. This global connectivity has expanded cultural exchange while increasing the international reach of visual storytelling.

Challenges and Future Directions

Despite its numerous advantages, digital storytelling also presents important challenges. Information overload makes it increasingly difficult for creators to capture audience attention within highly competitive digital environments. Short-form content has reduced average attention spans, encouraging rapid consumption rather than deep narrative engagement. Algorithmic recommendation systems may also create content "filter bubbles," limiting exposure to diverse perspectives by repeatedly suggesting similar material. Data privacy concerns, misinformation, copyright violations, and ethical questions surrounding artificial intelligence further complicate digital media ecosystems.

Nevertheless, future developments promise continued innovation. Artificial intelligence is expected to enhance personalized storytelling by adapting narratives according to individual preferences and emotional responses. Virtual Reality, Augmented Reality, and mixed reality technologies will create increasingly immersive experiences, while blockchain may improve digital rights management and creator compensation. The emergence of the metaverse may further redefine audience experiences by enabling persistent virtual environments where storytelling becomes collaborative, interactive, and socially connected across global digital communities [5].

Conclusion

The evolution of visual storytelling reflects the continuous interaction between technological innovation and human creativity. Digital transformation has fundamentally reshaped how narratives are produced, distributed, and experienced, expanding storytelling beyond traditional cinema into highly interactive and immersive digital ecosystems. Social media, streaming platforms, artificial intelligence, virtual reality, and augmented reality have transformed audiences from passive viewers into active participants who contribute to narrative development through online engagement and content creation.

These innovations have enhanced accessibility, personalization, and emotional engagement while creating new opportunities for filmmakers, educators, marketers, and media organizations. At the same time, challenges such as algorithmic bias, digital ethics, information overload, and copyright protection require careful consideration to ensure sustainable and responsible media development.

As emerging technologies continue to evolve, visual storytelling will become increasingly adaptive, intelligent, and collaborative. Organizations capable of integrating technological innovation with compelling narrative design and meaningful audience engagement will shape the future of digital entertainment. Ultimately, the convergence of visual storytelling and digital media represents one of the most significant transformations in contemporary communication, redefining the relationship between creators, narratives, and audiences in the digital age.

References

1. Jenkins, H. (2006). Convergence culture: Where old and new media collide. New York University Press.

2. Jenkins, H., Ford, S., & Green, J. (2013). Spreadable media: Creating value and meaning in a networked culture. New York University Press.

3. Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. Business Horizons, 53(1), 59–68. https://doi.org/10.1016/j.bushor.2009.09.003

4. Ryan, M.-L. (2015). Narrative as virtual reality 2: Revisiting immersion and interactivity in literature and electronic media. Johns Hopkins University Press.

5. Sundar, S. S. (2020). The handbook of the psychology of communication technology. John Wiley & Sons.

6. Van Dijck, J., Poell, T., & De Waal, M. (2018). The platform society: Public values in a connective world. Oxford University Press.

7. Yoo, C. Y., & Drumwright, M. E. (2018). Digital storytelling, consumer engagement, and interactive media experiences. Journal of Interactive Advertising, 18(2), 87–101. https://doi.org/10.1080/15252019.2018.1476154

THE IMPACT OF RENEWABLE ENERGY SOURCES ON SUSTAINABLE ECONOMIC DEVELOPMENT

Guliyeva J.
Azerbaijan University of Architecture and Construction
ORCID ID: 0000-0002-3568-1788
Ibrahimova R.,
Taghiyeva G.,
Guliyeva Ya.
Ganja State University
DOI: 10.5281/zenodo.21934802

Abstract

This text analyzes how renewable energy sources (RES) have become a key driver of sustainable economic development, economic diversification, and macroeconomic stability. The rapid decline in the cost of advanced technologies—especially solar PV and wind energy—has made building new green power plants more cost-effective than even the operational expenses of existing coal plants. This trend reduces energy costs for both industries and consumers through record-low bids in global tenders.

The transition to a renewable energy model stimulates job creation, local entrepreneurship (particularly through Distributed Renewable Energy Systems in developing nations), and offers higher economic returns than traditional stimulus measures. The private sector plays a paramount role, highlighted by record-breaking Power Purchase Agreements (PPAs) and corporate commitments under the RE100 initiative, with companies like Google leading the charge.

An analysis of Total Final Energy Consumption (TFEC) reveals that while renewable energy has achieved its highest penetration in the Electricity sector (26.4% share), the largest energy-consuming sectors—Thermal energy (51% share, 10.1% RES) and Transport (32% share, 3.3% RES)—remain heavily dependent on fossil fuels. Accelerating renewable deployment in these sectors represents a major opportunity for growth. From a macroeconomic perspective, transitioning to RES minimizes conversion losses, reduces national energy intensity, and drives sustainable GDP growth.

Keywords: Sustainable economic development, Renewable energy sources, Energy intensity reduction, Power Purchase Agreements, Final energy consumption.

Introduction

Sustainable economic development is a strategy aimed at ensuring long-term economic growth without disrupting ecological balance or depleting natural resources. Economic models based on conventional fossil fuels (oil, natural gas, and coal) are gradually losing their effectiveness due to high carbon emissions and the accelerating impacts of global climate change. In this context, renewable energy sources (RES) have become not only an environmental alternative but also a key driver of economic diversification and sustainability.

The acceleration of economic growth is directly linked to the rapid decline in the cost of renewable energy technologies and their ability to fully compete with conventional resources. Today, in almost every part of the world, generating electricity from wind and solar photovoltaic (PV) systems is more cost-effective than building new coal-fired power plants. In fact, in many regions of China, the European Union, India, and the United States, establishing new wind or solar plants is cheaper than even the operational expenses of existing, already functional coal power plants. This sharp drop in costs has paved the way for record-low bids in global tenders and auctions, reducing energy expenses for both industries and consumers while stimulating overall economic growth.

At the same time, the transition to a renewable energy model is characterized by job creation and macroeconomic stability. Distributed Renewable Energy Systems (DREA), which encompass off-grid solar systems and mini-grids, serve approximately 150 million people in developing countries. These systems lead to the development of local entrepreneurship and an increase in direct employment within the sector, particularly in countries like India, Kenya, and Nigeria. Economic studies highlighted in the report also confirm that investments in renewable energy and building energy efficiency ("green recovery measures") create more jobs and deliver higher economic returns compared to traditional economic stimulus measures.

In this process, the role of the private sector and Power Purchase Agreements (PPAs) are of paramount importance in terms of optimizing business costs and ensuring economic resilience. Unsurprisingly, in 2019, private corporations signed PPAs for a record capacity of approximately 20 GW for renewable energy procurement, which accounts for nearly 40% of the total contract volume signed over the last decade. Furthermore, under the RE100 initiative, the number of leading global corporations committed to sourcing 100% of their operations from renewable energy reached 229 by early 2020, with Google emerging as the world's largest corporate buyer, procuring 2.7 GW of renewable capacity during the year.

Table 1.

Comparative Analysis of Global Renewable Energy Indicators

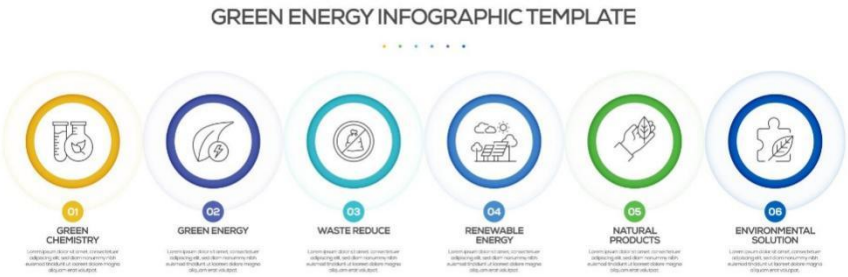
Energy Technology	Global Installed Capacity (GW)	Annual Investment Volume	Economic Sustainability Impact
Solar PV	627	High	Development of SMEs and local energy independence through rooftop systems
Wind Energy	651	Record Level	Large-scale industrial production and substantial investment inflows through offshore projects
Hydropower	1150	Stable / Moderate	Base-load supply, regional infrastructure development, and water resource management
Bioenergy	139	Specific	Stimulation of the agricultural sector and integration of waste into the circular economy
Geothermal & Ocean Energy	14.4	Limited	High initial costs but strong potential for continuous heat and power generation

1. Global Energy Balance and Investment Trends

At the global level, investments in the renewable energy sector serve as a significant catalyst for economic growth. Studies indicate that capital directed toward renewable energy creates more employment opportunities and stimulates technological innovation more effectively than investments in the fossil fuel sector.

Structural Modeling

The influence of renewable energy on sustainable economic development is not linear but rather a multi-sectoral chain reaction. The conceptual framework below illustrates these interactions.



Scheme 1. Multiplier Effect of Renewable Energy on Sustainable Economic Development

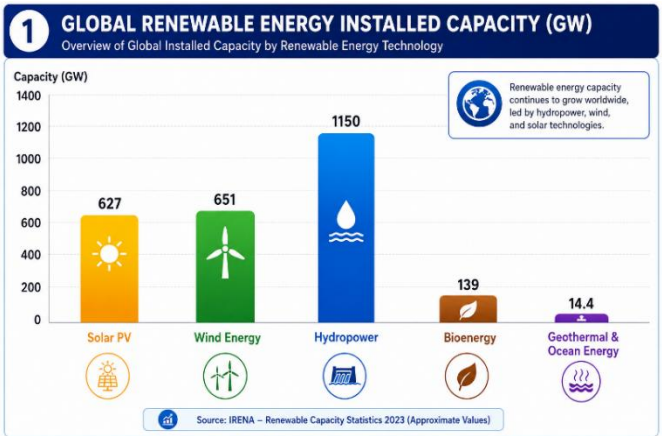
3. Sectoral Analysis of Final Energy Consumption

For renewable energy to be fully integrated into the economy, its contribution must increase not only within the electricity sector but also across other major economic sectors.

The following chart illustrates the structure of Total Final Energy Consumption (TFEC) and the current penetration of renewable energy within each sector.

Global Final Energy Consumption (%) and Renewable Energy Share

- Thermal Energy (Heating/Cooling) — 51%
  - Renewable Energy Share: 10.1%
- Transport Sector — 32%
  - Renewable Energy Share: 3.3%
- Electricity/Power Sector — 17%
  - Renewable Energy Share: 26.4%



The distribution of global final energy consumption reveals significant differences in the penetration of renewable energy across major economic sectors. The **Thermal Energy sector**, which includes heating and cooling applications, accounts for the largest share of total final energy consumption at **51%**. However, renewable energy contributes only **10.1%** to this sector. This indicates that industrial processes, residential heating systems, and commercial buildings remain heavily dependent on fossil fuels, creating both environmental pressures and economic vulnerability to fuel price fluctuations.

The **Transport Sector** represents **32%** of global final energy consumption, yet renewable energy accounts for only **3.3%** of the sector's energy use. This low share highlights the challenges associated with transport decarbonization. Although electric vehicles, sustainable biofuels, and hydrogen technologies are expanding, their overall contribution remains limited. Therefore, transportation continues to be one of the most fossil-fuel-dependent sectors of the global economy.

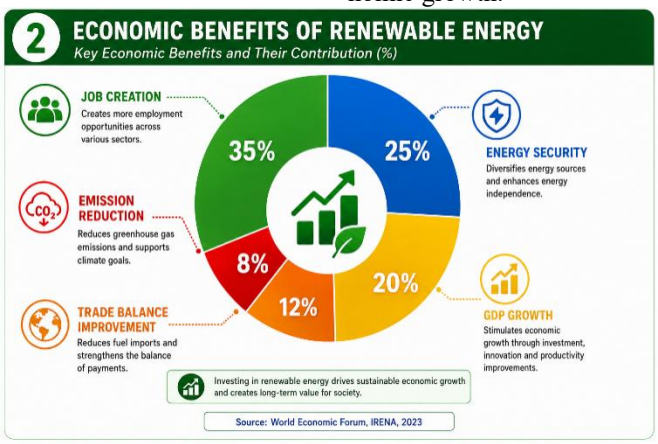
In contrast, the **Electricity/Power Sector** consumes only **17%** of total final energy but demonstrates the highest level of renewable energy integration, with a renewable share of **26.4%**. This reflects rapid technological progress and declining costs in solar and wind power generation. As a result, renewable electricity has become increasingly competitive and economically attractive compared to conventional fossil-fuel-based power generation.

Overall, the graph demonstrates that renewable energy deployment has achieved its greatest success in the electricity sector, while substantial opportunities remain in thermal applications and transportation. Accelerating renewable energy adoption in these sectors is essential for achieving long-term sustainability, reducing greenhouse gas emissions, and supporting green economic growth.

4. Direct Macroeconomic Impacts of Renewable Energy

Reduction of Energy Intensity and GDP Growth

The transition to renewable energy technologies reduces a country's primary energy intensity, defined as the amount of energy required to generate one unit of GDP. Since solar and wind technologies minimize conversion losses commonly associated with conventional thermal power plants, overall economic efficiency increases. This enables more effective allocation of national resources and contributes to sustainable economic growth.


2
ECONOMIC BENEFITS OF RENEWABLE ENERGY
Key Economic Benefits and Their Contribution (%)
JOB CREATION
Creates more employment opportunities across various sectors.
35%
25%
ENERGY SECURITY
Diversifies energy sources and enhances energy independence.
EMISSION REDUCTION
Reduces greenhouse gas emissions and supports climate goals.
8%
20%
12%
TRADE BALANCE IMPROVEMENT
Reduces fuel imports and strengthens the balance of payments.
GDP GROWTH
Stimulates economic growth through investment, innovation and productivity improvements.
Investing in renewable energy drives sustainable economic growth and creates long-term value for society.
Source: World Economic Forum, IRENA, 2023

Key Economic Benefits and Their Contribution (%)

Investing in renewable energy drives sustainable economic growth and creates long-term value for society. The five key macroeconomic benefits and their respective percentage contributions to the total economic impact are distributed as follows:

- **Job Creation — 35%** Creates more employment opportunities across various sectors.
- **Energy Security — 25%** Diversifies energy sources and enhances energy independence.
- **GDP Growth — 20%** Stimulates economic growth through investment, innovation, and productivity improvements.
- **Trade Balance Improvement — 12%** Reduces fuel imports and strengthens the balance of payments.
- **Emission Reduction — 8%** Reduces greenhouse gas emissions and supports climate goals.

Employment Generation and Social Welfare

The green economy is a labor-intensive sector with significant employment potential. Distributed renewable energy systems, including mini-grids and decentralized solar installations, create new opportunities in agriculture, manufacturing, and service industries, particularly in developing regions. This contributes to poverty reduction and regional economic equality.

Improvement of the Trade Balance

For energy-importing countries, investments in renewable energy help retain financial resources within the national economy. By satisfying domestic energy demand through local renewable resources, countries can reduce trade deficits, strengthen foreign exchange reserves, and enhance currency stability.

Solar Energy (Solar PV)

As the most dynamic and rapidly growing branch of the global green transition, Solar PV currently boasts an impressive 627 GW of global generation capacity. Thanks to a drastic decline in technological costs, it has become the most favored sector for global investors and pulls in the highest annual investment volume among all renewable energy sources.

Wind Energy (Wind Energy)

Wind energy stands as a powerhouse driving large-scale commercial utility projects worldwide. Through expanding onshore and offshore installations, its global capacity has reached 651 GW. Because it offers high reliability and strong efficiency for investors, it maintains its position as a leading group in global capital flows, pulling in record levels of funding.

Hydropower (Hydropower)

Hydropower is the oldest, most established, and massive member of the renewable energy family. With a total capacity of 1,150 GW, it holds an absolute leadership position on a global scale. Unlike other variable alternative sources, it is less dependent on sudden weather shifts, making it perfect for securing the baseline grid load. Since the infrastructure is already mature, its investment trajectory is stable and balanced.

Bioenergy (Bioenergy)

Representing 139 GW of the global energy mix, bioenergy serves a unique purpose. Instead of driving massive, overarching power grids, it focuses heavily on agricultural waste management, local industrial heating, and rural development projects. For this reason, its investment volume remains moderate and highly specialized compared to the larger power sectors.

Geothermal & Ocean Energy (Geothermal & Ocean)

Tapping into the earth's core heat and the raw power of ocean waves, this sector constitutes the smallest slice of the renewable portfolio at 14.4 GW. Due to strict geographic limitations and exceptionally high initial drilling and installation costs, it currently sees limited and more cautious investment allocation from global funders.

The future landscape of alternative energy is anchored by three distinct sectoral pillars. **Solar PV** acts as the ultimate investment catalyst and a primary magnet for global green capital, continuously breaking down cost barriers and actively shaping next-generation energy trends. Alongside it, **Hydropower** stands as the undisputed infrastructure giant and the foundational backbone of renewable networks, maintaining its dominance by generating the largest total volume of clean electricity worldwide. Meanwhile, **Wind Energy** has solidified its role as an industrial powerhouse; driven by the rapid rise of massive offshore installations, it now holds an indispensable position in meeting the heavy power demands of modern industrial production.

Conclusion

Renewable energy sources are not merely an environmental objective; they constitute one of the fundamental pillars of sustainable economic development. The primary challenge of the energy transition lies in ensuring that investments and policy instruments are directed not only toward electricity generation but also toward industrial heating and transportation sectors. The synchronization of renewable energy strategies with economic stimulus policies represents the most effective pathway toward long-term green growth and economic resilience.

It demonstrates that renewable energy is not merely an environmental alternative, but has also become the energy source with the highest economic and financial viability in global markets. Rapid technological innovations and the scaling up of production over the past decade have sharply driven down the levelized cost of electricity (LCOE). This trend has transformed solar photovoltaic (PV) and onshore wind energy into the cheapest sources of new electricity in most regions of the world. In many countries, renewable energy projects are now reaching grid parity even without any government subsidies or financial support, outcompeting traditional fossil fuels in terms of price.

One of the greatest macroeconomic advantages of this transition manifests in the efficiency of long-term operational and maintenance expenditures (OPEX). Since fuel costs are non-existent for solar and wind power plants, these technologies fully insulate investors and state budgets from price fluctuations (volatility) in global oil, gas, and coal markets, making future financial forecasting more transparent. The dramatic decline in prices has established a new economic reality: in many regions, constructing an entirely new renewable energy facility requires less capital than simply maintaining existing, operational coal power plants (due to operation and fuel procurement costs). This economic advantage leads to record-low bids for every kilowatt-hour of electricity in global tenders and auctions, driving down wholesale prices and easing the financial burden on end consumers.

On the other hand, renewable energy demonstrates high efficiency in terms of resource sessional effectiveness and corporate financial optimization. The decline of more than 10% in global primary energy intensity (energy consumption per unit of GDP) in recent years proves that countries can generate greater economic value with fewer energy resources. Because solar PV and wind systems generate electricity directly, the massive thermodynamic transformation losses that occur during fuel combustion in thermal power plants do not take place in this process, thereby maximizing resource efficiency. Within the business sector, major global corporations ensure their corporate financial efficiency by signing 10- to 20-year long-term Power Purchase Agreements (PPAs) with renewable energy producers to stabilize future energy costs and minimize risks.

References

1. Amiraslanov F., Asadova G., Mammadova Ye., Mammadov Kh., 2025 №69, pp. 3-6. Monitoring spatial changes in water resources with CİS DOİ: https://doi.org/10.5281/zenodo.17046545 https://www.lyon-science.com/wp-content/uploads/2025/09/Lyon_69.pdf

2. Iskandarova T., Aliyeva Ye., Asadova G., Mahmudov S., Amiraslanov F. No 162 (2025). pp. 8-13. Monitoring the impact of climate change on local ecosystems. DOI: 10.5281/zenodo.15621839 The-scientific-heritage-No-162-162-2025.pdf

3. Алиева Е.Д., Асадова Г.А., Исмаилова А.Б. ”Оцениван эко-географических условий земель Азербайджана”. Международный научный журнал «ВЕСТНИК НАУКИ» № 4 (85) Том 3.

АПРЕЛЬ 2025 г. 1123 – 1127 вестник-науки.рф/archiv/journal-4-85-3.pdf#page=1123. journal-4-85-3.pdf

4. Elshad Mammadov, G. Asadova, İrshad Abbasov (ganja, azerbaijan) “İnvestigation of the impact of climate change on the area changes of water basins in Azerbaijan using GİS (geographic information systems)”. National academy of scientific and innovative research «science and education: modern time» (issue 13,2025). pp. 196-199. Просмотр «2025: ТОМ 13, SCIENCE AND EDUCATION MODERN TIME»

5. Gahramanova S., Asadova G., Hasanov V., “Climate change as a determinant of human health: emerging challenges and adaptation strategies”. German International Journal of Modern Science №117, 2025. pp. 15-17. DOI: 10.5281/zenodo.17865024. Deutsche-internationale-Zeitschrift-für-zeitgenössische-Wissenschaft-№117-2025.pdf

6. Gurbanova S., Asadova G. , Mammadova Kh.,Talibzade Z., Bagirova A. A. “Geospatial analysis of climate change–induced transformations in water bodies”. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft №118 2025. pp. 18-21. DOI: 10.5281/zenodo.18003098. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft №118 2025.pdf - Яндекс Документы

7. Гасанов В., Асадова Г.А., Суваров Н. “Анализ роли перехода к зелёной энергетике в борьбе с изменением климата”. Вестник науки: №12 (93) том 3. С. 2116 - 2123. 2025 г. vestnik-nauki.com/article/27745

8. Xudu MAMMEDOV, G. ASADOVA, Yegana MAMMEDOVA, Nurida HASANOVA. Research of the water regime of the rivers of the hajikand goygol zone. pp. 42-48. International multidisciplinary ecology and environmental…614b1f_9bc1d517dee24dfca0f585f3ef68220f.pdf

TOWARDS A GREEN FUTURE: ECOLOGICAL FACTORS AND THE PATH FROM IDEA TO SUCCESS

Abbasov F.,
ORCID ID: 0009-0008-0124-8469
Islamova E.,
Jafarova K.,
Babayeva L.
ORCID ID: 0009-0005-3381-8014
Ganja State University
DOI: 10.5281/zenodo.21934827

Abstract

The global economy and society are undergoing a profound transformation. While ecological projects were once viewed merely as matters of corporate social responsibility or charity, green practices have now become the primary driving force behind business competitiveness, innovation, and long-term success. Properly assessing ecological factors and transforming green ideas into viable, profitable, and sustainable ventures is the defining formula for future development.

This article analyzes the impact of ecological factors on project success, outlines the practical execution stages of a green idea, and provides a chronological comparative analysis spanning from 2015 to 2026.

Keywords: Sustainable development, Ecological projects, Green innovation, Project management, Environmental sustainability, Green economy, Business competitiveness, Circular economy.

Introduction

The transition toward sustainable development has become one of the most significant global priorities of the twenty-first century. Increasing environmental degradation, climate change, resource depletion, and biodiversity loss have compelled governments, businesses, and international organizations to integrate ecological considerations into their development strategies. As a result, ecological projects have evolved from being voluntary environmental initiatives into strategic instruments for achieving economic growth, social well-being, and environmental sustainability.

In recent years, the concept of green projects has expanded beyond environmental protection to encompass innovation, competitiveness, and long-term value creation. Organizations increasingly recognize that integrating ecological principles into project planning and implementation can reduce operational risks, improve resource efficiency, strengthen stakeholder confidence, and enhance market competitiveness. Consequently, environmental sustainability is no longer viewed as a constraint on development but as a catalyst for innovation and sustainable economic progress.

1. Ecological Factors at the Core of Green Ideas

To successfully implement any green idea, one must thoroughly analyze the environmental factors within the operating landscape. These factors shape both the risks and the opportunities of a project: **Resource Scarcity and Efficiency:** The depletion of water, energy, and raw materials is forcing businesses to transition toward a "circular economy" model. Minimizing waste translates directly into cost reduction.

Carbon Footprint and Regulations: International and local regulations strictly limit carbon emissions. Carbon taxes and trading systems make ecologically clean technologies highly attractive from an economic perspective. **Biodiversity Conservation:** Ensuring that projects do not harm local ecosystems—and instead contribute to restoring biodiversity—is a core requirement of modern environmental standards.

Shifting Consumer Behavior: A new generation of consumers prioritizes eco-friendly, ethically produced goods and is willing to pay a premium for them.

2. From Idea to Success: The Architectural Framework of Green Projects

For an ecological concept to transcend theory and achieve real-world success, it must progress through sequential, scientifically grounded, and well-managed phases. The following roadmap outlines the path to success for green startups and corporate ecological initiatives:

1.Assessment of Ecological Needs & Idea Generation:

Phase 1. Analyze local and global environmental challenges (e.g., waste management, energy inefficiency) and formulate an innovative "green idea" to address them.

2.Life Cycle Assessment (LCA) & Feasibility Study:

Phase 2. Evaluate the environmental impact of the product or service across its entire lifecycle, from raw material extraction to disposal, and calculate its financial viability.

3.Securing Green Financing:

Phase 3. Attract capital from green bonds, environmental grants, or venture capital funds that prioritize ESG (Environmental, Social, and Governance) criteria.

4.Innovative Pilot Implementation & Tech Deployment:

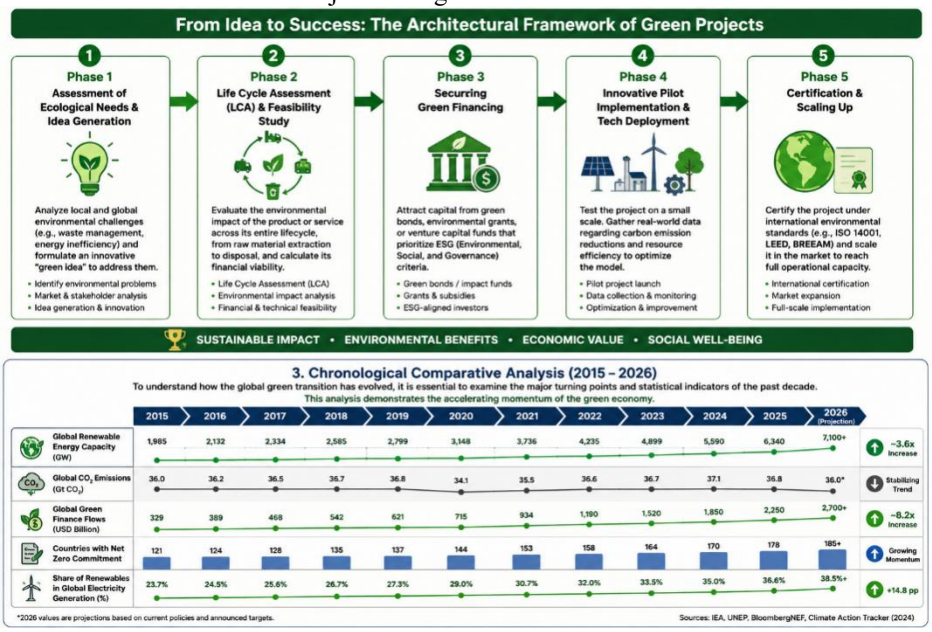
Phase 4. Test the project on a small scale. Gather real-world data regarding carbon emission reductions and resource efficiency to optimize the model.

5.Certification & Scaling Up:

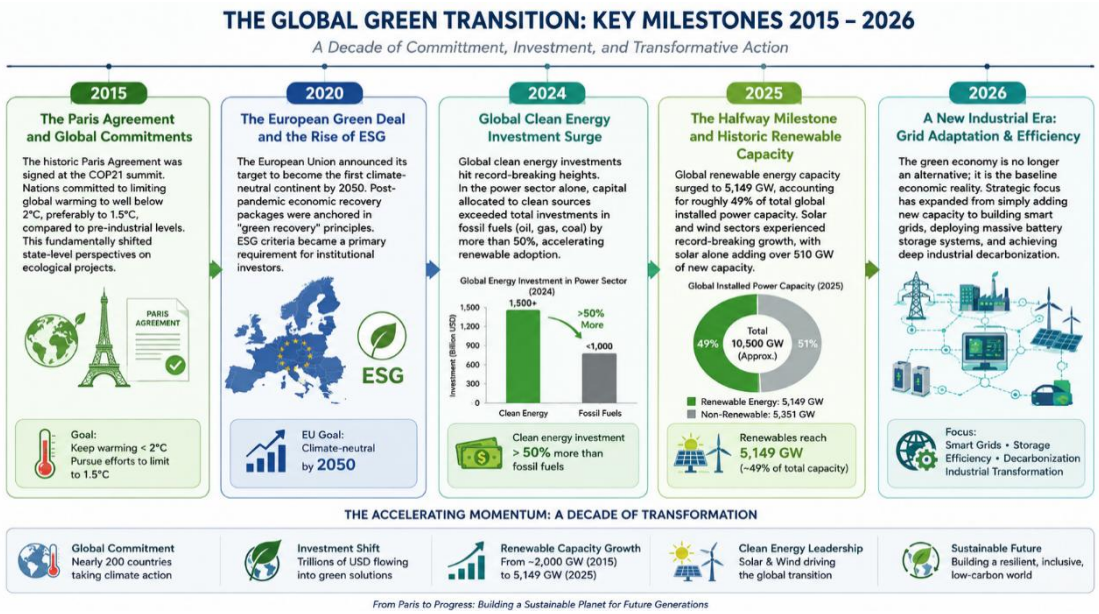
Phase 5. Certify the project under international environmental standards (e.g., ISO 14001, LEED, BREEAM) and scale it in the market to reach full operational capacity.

3. Chronological Comparative Analysis (2015 – 2026)

To understand how the global green transition has evolved, it is essential to examine the major turning points and statistical indicators of the past decade. This analysis demonstrates the accelerating momentum of the green economy.


From Idea to Success: The Architectural Framework of Green Projects
1
Phase 1
Assessment of Ecological Needs & Idea Generation
Analyze local and global environmental challenges (e.g., waste management, energy inefficiency) and formulate an innovative "green idea" to address them.
• Identify environmental problems
• Market & stakeholder analysis
• Idea generation & innovation
2
Phase 2
Life Cycle Assessment (LCA) & Feasibility Study
Evaluate the environmental impact of the product or service across its entire lifecycle, from raw material extraction to disposal, and calculate its financial viability.
• Life Cycle Assessment (LCA)
• Environmental impact analysis
• Financial & technical feasibility
3
Phase 3
Securring Green Financing
Attract capital from green bonds, environmental grants, or venture capital funds that prioritize ESG (Environmental, Social, and Governance) criteria.
• Green bonds / impact funds
• Grants & subsidies
• ESG-aligned investors
4
Phase 4
Innovative Pilot Implementation & Tech Deployment
Test the project on a small scale. Gather real-world data regarding carbon emission reductions and resource efficiency to optimize the model.
• Pilot project launch
• Data collection & monitoring
• Optimization & improvement
5
Phase 5
Certification & Scaling Up
Certify the project under international environmental standards (e.g., ISO 14001, LEED, BREEAM) and scale it in the market to reach full operational capacity.
• International certification
• Market expansion
• Full-scale implementation
SUSTAINABLE IMPACT • ENVIRONMENTAL BENEFITS • ECONOMIC VALUE • SOCIAL WELL-BEING
3. Chronological Comparative Analysis (2015 – 2026)
To understand how the global green transition has evolved, it is essential to examine the major turning points and statistical indicators of the past decade.
This analysis demonstrates the accelerating momentum of the green economy.
2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 (Projection)
Global Renewable Energy Capacity (GW)
1,985 2,132 2,334 2,585 2,799 3,148 3,736 4,235 4,899 5,590 6,340 7,100+
~3.6x Increase
Global CO2 Emissions (Gt CO2)
36.0 36.2 36.5 36.7 36.8 34.1 35.5 36.6 36.7 37.1 36.8 36.0*
Stabilizing Trend
Global Green Finance Flows (USD Billion)
329 389 468 542 621 715 934 1,190 1,520 1,850 2,250 2,700+
~8.2x Increase
Countries with Net Zero Commitment
121 124 128 135 137 144 153 158 164 170 178 185+
Growing Momentum
Share of Renewables in Global Electricity Generation (%)
23.7% 24.5% 25.6% 26.7% 27.3% 29.0% 30.7% 32.0% 33.5% 35.0% 36.6% 38.5%+
+14.8 pp
*2026 values are projections based on current policies and announced targets.
Sources: IEA, UNEP, BloombergNEF, Climate Action Tracker (2024)

The Paris Agreement and Global Commitments 2015
The historic Paris Agreement was signed at the COP21 summit. Nations committed to limiting global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. This fundamentally shifted state-level perspectives on ecological projects.
The European Green Deal and the Rise of ESG 2020
The European Union announced its target to become the first climate-neutral continent by 2050. Post-pandemic economic recovery packages were anchored in "green recovery" principles. ESG criteria became a primary requirement for institutional investors.
Global Clean Energy Investment Surge 2024
Global clean energy investments hit record-breaking heights. In the power sector alone, capital allocated to clean sources exceeded total investments in fossil fuels (oil, gas, coal) by more than 50%, accelerating renewable adoption.
The Halfway Milestone and Historic Renewable Capacity 2025
Global renewable energy capacity surged to 5,149 GW, accounting for roughly 49% of total global installed power capacity. Solar and wind sectors experienced record-breaking growth, with solar alone adding over 510 GW of new capacity.
A New Industrial Era: Grid Adaptation & Efficiency 2026
The green economy is no longer an alternative; it is the baseline economic reality. Strategic focus has expanded from simply adding new capacity to building smart grids, deploying massive battery storage systems, and achieving deep industrial decarbonization.


THE GLOBAL GREEN TRANSITION: KEY MILESTONES 2015 – 2026
A Decade of Committment, Investment, and Transformative Action
2015
The Paris Agreement and Global Commitments
The historic Paris Agreement was signed at the COP21 summit. Nations committed to limiting global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. This fundamentally shifted state-level perspectives on ecological projects.
PARIS AGREEMENT
Goal: Keep warming < 2°C Pursue efforts to limit to 1.5°C
2020
The European Green Deal and the Rise of ESG
The European Union announced its target to become the first climate-neutral continent by 2050. Post-pandemic economic recovery packages were anchored in "green recovery" principles. ESG criteria became a primary requirement for institutional investors.
ESG
EU Goal: Climate-neutral by 2050
2024
Global Clean Energy Investment Surge
Global clean energy investments hit record-breaking heights. In the power sector alone, capital allocated to clean sources exceeded total investments in fossil fuels (oil, gas, coal) by more than 50%, accelerating renewable adoption.
Global Energy Investment in Power Sector (2024)
1,500+
>50% More
<1,000
Clean Energy
Fossil Fuels
Clean energy investment > 50% more than fossil fuels
2025
The Halfway Milestone and Historic Renewable Capacity
Global renewable energy capacity surged to 5,149 GW, accounting for roughly 49% of total global installed power capacity. Solar and wind sectors experienced record-breaking growth, with solar alone adding over 510 GW of new capacity.
Global Installed Power Capacity (2025)
49%
Total 10,500 GW (Approx.)
51%
Renewable Energy: 5,149 GW
Non-Renewable: 5,351 GW
Renewables reach 5,149 GW (~49% of total capacity)
2026
A New Industrial Era: Grid Adaptation & Efficiency
The green economy is no longer an alternative; it is the baseline economic reality. Strategic focus has expanded from simply adding new capacity to building smart grids, deploying massive battery storage systems, and achieving deep industrial decarbonization.
Focus: Smart Grids • Storage Efficiency • Decarbonization Industrial Transformation
THE ACCELERATING MOMENTUM: A DECADE OF TRANSFORMATION
Global Commitment Nearly 200 countries taking climate action
Investment Shift Trillions of USD flowing into green solutions
Renewable Capacity Growth From ~2,000 GW (2015) to 5,149 GW (2025)
Clean Energy Leadership Solar & Wind driving the global transition
Sustainable Future Building a resilient, inclusive, low-carbon world
From Paris to Progress: Building a Sustainable Planet for Future Generations

Comparative Overview of Key Metrics

The table below outlines the evolution of core parameters in the global green transition:

Metric / Year	2015	2020	2026
Renewable Share in Global Capacity (%)	~22%	~28%	**~49.5%**
Primary Investment Driver	Government subsidies and grants	ESG standards and institutional investors	**Technological competitiveness, industrial efficiency, and market demand**
Business Approach	Green initiatives viewed as an "additional expense"	Adopted for corporate reporting and brand image	**Core pillar of corporate strategy and a tool for profitability**
Technological Focus	Early-stage solar and wind energy	Electric Vehicles (EVs) and energy efficiency	**Green hydrogen, smart grids, battery storage, and carbon capture (CCUS)**

4. Challenges and Solutions on the Path to Success

While green projects offer immense potential, innovators and entrepreneurs frequently encounter distinct barriers:

1. High Initial Capital Expenditures (CAPEX): Setting up green technologies can be costly during the initial phases.

Solution: Utilize green loans, government incentives, and present investors with precise, data-driven projections of long-term operational savings (ROI) generated by resource efficiency.

2. The Risk of Greenwashing: Companies making exaggerated or false ecological claims undermine consumer trust.

Solution: Practice absolute transparency, provide third-party audited reports, and obtain recognized international environmental certifications.

3. Infrastructure Gaps: For example, producing electric vehicles is futile if charging networks are non-existent.

Solution: Leverage Public-Private Partnerships (PPPs) and build synergies with ecosystem partners to develop co-dependent infrastructure.

Conclusion

The path toward a green future is no longer an idealistic dream; it is an economic inevitability. The trajectory since 2015 proves that ecological factors now dictate the flow of global capital, policy, and technological innovation. With nearly half of the world's power capacity now derived from renewable sources, the transition is irreversible.

On the road from idea to success, businesses that merge digital and green technologies while solving real-world ecological challenges efficiently will lead the global market.

References

1. Amiraslanov F., Asadova G., Mammadova Ye., Mammadov Kh., 2025 №69, pp. 3-6. Monitoring spatial changes in water resources with CİS/ DOİ: https://doi.org/10.5281/zenodo.17046545

https://www.lyon-science.com/wp-content/uploads/2025/09/Lyon_69.pdf

2. Iskandarova T., Aliyeva Ye., Asadova G., Mahmudov S., Amiraslanov F. No 162 (2025). pp. 8-13. Monitoring the impact of climate change on local ecosystems. DOI: 10.5281/zenodo.15621839 The-scientific-heritage-No-162-162-2025.pdf

3. Алиева Е.Д., Асадова Г.А., Исмаилова А.Б. ”Оцениван эко-географических условий земель Азербайджана”. Международный научный журнал «ВЕСТНИК НАУКИ» № 4 (85) Том 3. АПРЕЛЬ 2025 г. 1123 – 1127/ вестник-науки.рф/archiv/journal-4-85-3.pdf#page=1123.journal-4-85-3.pdf

4. Elshad Mammadov, G. Asadova, İrshad Abbasov (ganja, azerbaijan) “İnvestigation of the impact of climate change on the area changes of water basins in Azerbaijan using GİS (geographic information systems)”. National academy of scientific and innovative research «science and education: modern time» (issue 13,2025). pp. 196-199. Просмотр «2025: ТОМ 13, SCIENCE AND EDUCATION MODERN TIME»

5. Gahramanova S., Asadova G., Hasanov V., “Climate change as a determinant of human health: emerging challenges and adaptation strategies”. German International Journal of Modern Science №117, 2025. pp. 15-17. DOI: 10.5281/zenodo.17865024. Deutsche-internationale-Zeitschrift-für-zeitgenössische-Wissenschaft-№117-2025.pdf

6. Gurbanova S., Asadova G., Mammadova Kh., Talibzade Z., Bagirova A. A. “Geospatial analysis of climate change–induced transformations in water bodies”. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft №118 2025. pp. 18-21. DOI: 10.5281/zenodo.18003098. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft №118 2025.pdf - Яндекс Документы

7. Гасанов В., Асадова Г.А., Суваров Н. “Анализ роли перехода к зелёной энергетике в борьбе с изменением климата”. Вестник науки: №12 (93) том 3. С. 2116 - 2123. 2025 г. vestnik-nauki.com/article/27745

8. Xudu MAMMEDOV, G. ASADOVA, Yegana MAMMEDOVA, Nurida HASANOVA. Research of the water regime of the rivers of the hajikand goygol zone. pp. 42-48. International multidisciplinary ecology and environmental…614b1f_9bc1d517dee24dfca0f585f3ef68220f.pdf

BEYOND THE NUMBERS: HIDDEN RED FLAGS BEFORE THE COLLAPSE

Islam N.
Master's Student, NJSC " Narxoz University ", Almaty, Republic of Kazakhstan
Nurgaliyeva A.
Candidate of Economic Sciences, PhD, NJSC " Narxoz University ", Almaty, Republic of Kazakhstan
DOI: 10.5281/zenodo.21934846

Abstract

Corporate collapses are typically preceded by a gradual accumulation of internal organizational problems that remain undetected for a long time and are not reflected in financial statements. The purpose of this study is to analyze hidden red flags as early non-financial warning signs of corporate crisis. The research is based on a qualitative review of the scientific literature and a comparative analysis of the cases of Theranos, Silicon Valley Bank, FTX, and Toshiba. The results show that the most significant hidden red flags relate to corporate governance, risk management, the organizational environment, and strategic management. It is concluded that the timely identification of these signals allows for a more comprehensive assessment of an organization's resilience and complements traditional financial performance analysis.

Keywords: Hidden red flags; corporate failure; corporate governance; risk management; organizational environment; financial performance.

Introduction

Major corporate failures rarely result from a single misstep or unexpected event. They are typically preceded by a long period of accumulating internal problems that gradually weaken the organization and increase its vulnerability to crisis. However, most of these problems remain virtually unnoticed until the consequences become irreversible.

Traditionally, researchers, auditors, and investors focus primarily on a company's financial performance. Financial statements, liquidity ratios, profitability, and solvency are considered the primary sources of information when assessing a business's sustainability. However, financial indicators do not always allow for the timely identification of processes that gradually shape the preconditions for future corporate failure.

It's becoming increasingly clear that the first signs of a crisis aren't just visible in financial statements. They can be linked to aspects of corporate governance, organizational culture, risk management, or strategic decisions. Such signals are rarely considered in isolation, but their cumulative impact often serves as an early warning sign of escalating problems within an organization. The purpose of this study is to analyze hidden red flags that precede corporate failures and to identify their significance for an earlier understanding of organizational problems. To achieve this goal, a qualitative approach is used, based on an analysis of the scientific literature and a comparative study of well-known corporate cases.

1 Beyond the Numbers

1.1 The Limitations of Financial Indicators

Financial indicators are traditionally considered the basis for assessing a company's performance and play a key role in management, investment, and audit decisions. Profitability, liquidity, financial stability, and efficiency indicators allow one to evaluate an organization's performance, identify changes in its financial position, and compare its performance with other market participants. Due to their objectivity and standardized nature, financial statements remain one of the most important sources of information for stakeholders.

At the same time, a question arises that is particularly relevant in the context of corporate failures: are financial indicators sufficient to promptly identify organizational problems that could lead a company to crisis? An analysis of modern scientific literature shows that the answer to this question is not straightforward. More and more studies view corporate failure not as a sudden deterioration in financial health, but as the result of a long process of accumulating internal problems that develop long before the first signs of financial instability [1]. Organizational decline develops gradually and is accompanied by changes in the management system, the quality of decision-making, resource allocation, and the organization's ability to adapt to changes in the external environment. Only at later stages do these processes begin to be reflected in the company's financial results [2].

This conclusion is supported by research in the field of risk management. The modern concept of Enterprise Risk Management considers risks much more broadly than just financial threats. Effective risk management requires the integration of decision-making processes, corporate governance, organizational structure, and strategic planning [3]. Consequently, a company's resilience is determined not only by financial results but also by the quality of its internal processes, which often remain invisible when analyzing financial statements alone [4].

Thus, financial indicators are a necessary, but not sufficient, tool for assessing an organization's long-term sustainability. They allow us to determine the company's current performance, but they do a much lesser job of explaining the internal processes that shape these results and how they may impact the company's future development. Therefore, analyzing corporate failures requires a broader approach that goes beyond the traditional interpretation of financial information and considers organizational, managerial, and strategic factors.

1.2 Looking Beyond Financial Performance

The limitations of financial indicators do not diminish their importance for assessing a company's performance. On the contrary, financial statements remain

a vital source of information about an organization's performance and financial position. However, modern academic literature increasingly emphasizes that understanding a company's long-term sustainability requires more than just analyzing financial results. An organization is a complex system in which financial indicators are only one element reflecting the consequences of internal processes, not all the causes of their occurrence.

Modern research in organizational management views a company as a set of interconnected elements, including corporate governance, organizational culture, internal control systems, decision-making processes, and risk management. It is the interaction of these elements that largely determines an organization's ability to adapt to changes in the external environment, effectively respond to emerging threats, and maintain sustainable development. Consequently, changes in these processes can indicate the emergence of organizational problems much earlier than they become visible in financial statements [4,5].

A similar approach is reflected in modern risk management research. The concept of Enterprise Risk Management views risk not as a collection of individual financial threats, but as a characteristic of an organization's entire management system. Therefore, effective risk management requires the integration of strategic planning, corporate governance, and decision-making processes. This approach enables the timely identification of potential threats and the reduction of the likelihood of crisis situations even before they are reflected in financial indicators [3].

Thus, assessing an organization's resilience requires a broader approach that goes beyond financial statement analysis. To understand the company's true state, it's necessary to consider not only its financial results but also changes in internal processes that determine the quality of management and the organization's ability to respond promptly to emerging challenges. It is in an organization's internal processes that the first signs of a future crisis often emerge, remaining virtually unnoticed until their consequences begin to be reflected in financial indicators.

2 Hidden Red Flags

2.1 Understanding Hidden Red Flags

The previous section demonstrated that financial indicators, despite their importance, do not always allow for the timely identification of processes that could lead an organization to a corporate crisis. This raises a logical question: what signals can indicate the development of serious organizational problems even before they become visible in financial statements?

In the academic literature, various terms are used to describe such phenomena, including early warning signals, red flags, fraud indicators, governance failures, and warning signs. Despite the differences in terminology, most studies share a common theme: organizational problems rarely arise suddenly. They are typically preceded by certain changes in the company's internal processes, which can serve as early warning signs of a future crisis [6].

In this study, such early non-financial warning signs are referred to as hidden red flags. This term refers to hidden indicators related to corporate governance, organizational culture, internal control systems, risk management, and strategic decisions that can indicate the accumulation of organizational problems long before they are reflected in the company's financial results. It is important to emphasize that each individual signal does not, by itself, indicate the inevitability of corporate failure. However, their cumulative effect may indicate weakening organizational resilience and an increased likelihood of a crisis.

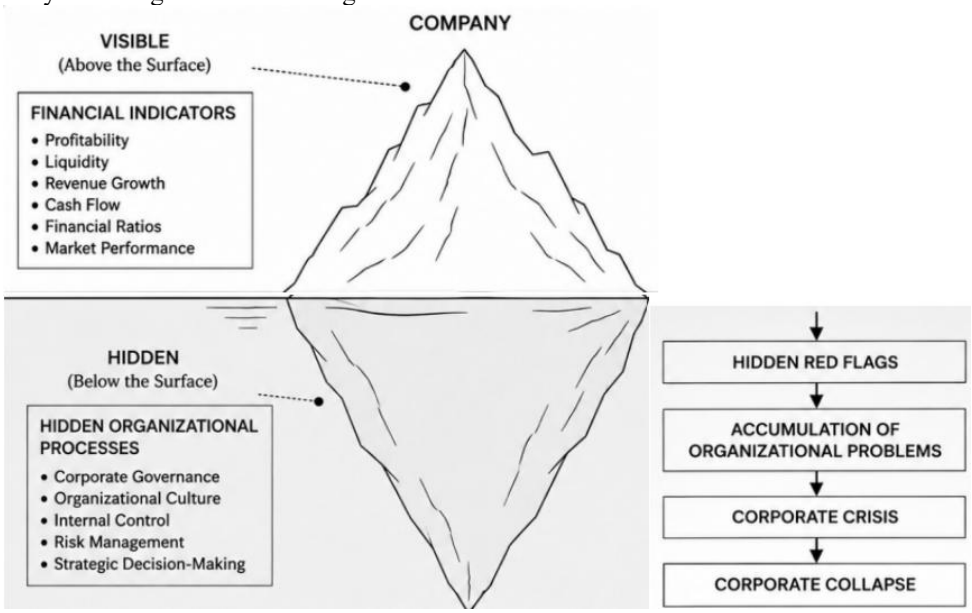


Figure 1. Beyond the Numbers: A Conceptual Overview of Hidden Red Flags Before Corporate Collapse.

One of the features of hidden red flags is their low visibility. In many cases, they go unnoticed not because they are not observable, but because they are hidden behind positive financial results, rapid company growth, high market valuation or a strong business reputation. That is why the first signs of organizational problems can be perceived for a long time as insignificant or temporary, while the real causes of a future crisis continue to accumulate within the organization. This approach allows us to consider hidden red flags as an important

element of early identification of corporate risks and explains the need to analyze not only financial indicators, but also internal organizational processes.

2.2 Categories of Hidden Red Flags

As noted above, hidden red flags are non-financial warning signals that reflect changes in an organization's internal processes long before they become visible in financial statements. A review of existing literature shows that such signals can manifest themselves in various aspects of a company's operations and rarely occur in isolation. Instead, they gradually accumulate, mutually reinforce each other, and form the basis for the development of a corporate crisis.

Despite differences in terminology and research approaches, most studies indicate that hidden red flags are primarily associated with four key organizational areas: corporate governance, risk management, organizational environment, and strategic management. This grouping is not a new classification, but rather a generalization of the main areas most frequently encountered in research on corporate governance, internal control, organizational culture, risk management, and organizational decline.

Table 1

Hidden Red Flags Across Key Organizational Areas

Organizational Area	Examples of Hidden Red Flags	Organizational Impact
Corporate Governance	Weak board oversight, ineffective internal control, lack of accountability	Weakens oversight and organizational discipline
Risk Management	Ignored emerging risks, excessive risk concentration, ineffective ERM	Increases exposure to unmanaged risks
Organizational Environment	Organizational silence, excessive secrecy, resistance to negative information	Delays identification and communication of problems
Strategic Management	Unrealistic performance targets, aggressive expansion, poor strategic decisions	Reduces long-term organizational resilience

Corporate governance shapes the system of distribution of authority, control, and responsibility within an organization. Insufficient oversight by the board of directors, weak internal controls, and the absence of effective accountability mechanisms create conditions in which organizational problems can remain unaddressed for long periods. As a result, even with favorable financial performance, the quality of management decisions gradually deteriorates, and the likelihood of serious crises increases [7].

Effective risk management requires the timely identification, assessment, and response to potential threats. However, in many organizations, risk management is formal or focused solely on financial risks. Ignoring risk concentration, insufficient integration of ERM into decision-making, and a lack of systematic monitoring can lead to the accumulation of hidden threats that become apparent only in the later stages of a crisis.

The organizational environment encompasses corporate culture, internal communications, and employee behavior. Phenomena such as organizational silence, excessive secrecy, limited information sharing, and resistance to discussing issues significantly reduce an organization's ability to promptly identify and address internal weaknesses. In such conditions, even issues known to management may go unaddressed.

Strategic decisions determine an organization's long-term development and its ability to adapt to environmental changes. Overly ambitious goals, aggressive growth strategies, ignoring external changes, and focusing solely on short-term results can gradually undermine a company's resilience. Such strategic errors are rarely immediately reflected in financial statements, yet they often become one of the key causes of subsequent organizational decline [1].

It should be noted that, in practice, hidden red flags are rarely limited to a single organizational area. Corporate crises typically result from the interaction of several interrelated factors, including deficiencies in corporate governance, weak risk management, organizational problems, and strategic errors. Therefore, when analyzing corporate failures, it is important to consider hidden red flags holistically, rather than as isolated, independent signals. This approach provides the foundation for further analysis of real corporate cases, presented in the next section.

3 Before the Collapse

3.1 Theranos: Excessive Secrecy as a Hidden Red Flag

Theranos was long considered one of Silicon Valley's most successful innovative startups. Promising a revolutionary blood-testing technology, the company attracted significant investment, achieved a high market valuation, and built a reputation as one of the most promising projects in healthcare. Despite outward signs of success, serious management problems gradually accumulated within the organization, remaining virtually unnoticed by investors, partners, and most employees. One of the most significant hidden red flags was excessive corporate secrecy, which significantly limited the transparency of internal processes and the ability to promptly identify critical flaws.

Excessive secrecy manifested itself not only in the protection of intellectual property, a common practice

for tech companies, but also in the organization of internal processes. Employees were divided between departments, access to information was strictly limited, and discussion of technical and management issues between teams was virtually impossible. Employees often lacked complete information even about the projects their colleagues were working on, hindering knowledge sharing and an objective assessment of the technology being developed. Furthermore, management actively used non-disclosure agreements (NDAs) and created an atmosphere in which expressing doubts or criticism was perceived as a breach of corporate loyalty. This organizational environment significantly reduced transparency and limited the ability to promptly identify internal problems.

According to the concept of hidden red flags, excessive secrecy is an organizational signal that doesn't directly impact financial performance but significantly increases the likelihood of hidden problems accumulating. Research on organizational culture and organizational silence shows that a lack of open communication, limited information sharing, and a fear of reporting problems hinder the early detection of errors and reduce the effectiveness of internal controls. As a result, the organization gradually loses the ability to promptly respond to emerging risks, despite maintaining seemingly favorable financial and market performance.

One of the reasons this signal went unnoticed for so long was the company's successful reputation. Investors and business partners perceived a high level of secrecy as a natural characteristic of an innovative startup seeking to protect its unique technology from competitors. The company's high valuation, the involvement of prominent investors, and constant media attention fostered a high level of trust, resulting in excessive secrecy being perceived as a competitive advantage rather than a potential source of organizational risk. This is why one of the most significant hidden red flags was concealed behind outward signs of success.

The Theranos experience demonstrates that corporate failure can develop long before financial signs of trouble appear. In this case, it wasn't financial performance that played a key role, but rather the organizational environment, which limited transparency, internal controls, and the timely identification of problems. Thus, excessive secrecy was not simply a characteristic of the corporate culture, but one of the most significant hidden red flags preceding the company's subsequent collapse [8].

3.2 Silicon Valley Bank: Ignored Concentration and Interest Rate Risk

Unlike Theranos, the collapse of Silicon Valley Bank (SVB) was not related to fraud or financial reporting. Prior to its bankruptcy, the bank was considered one of the most successful financial institutions serving the US technology sector. However, behind its solid financial performance, risks gradually emerged that were not promptly assessed by management and the risk management system. This makes the Silicon Valley Bank case a prime example of how hidden organizational signals can remain undetected for a long time, despite an apparently favorable financial position.

One of the most significant hidden red flags was the high concentration of interest rate and deposit risk. During a period of low interest rates, the bank allocated a significant portion of its deposits to long-term government bonds and fixed-income mortgage-backed securities. At the same time, its client base was concentrated primarily among technology companies and venture capital funds, significantly increasing the likelihood of a massive deposit run in the event of a deterioration in market conditions. This combination of assets and deposit structure made the bank extremely sensitive to changes in interest rates and a sharp decline in liquidity.

From the perspective of the hidden red flags concept, these circumstances reflect deficiencies in the risk management system. Despite information about high risk concentrations, they were not perceived as critical, as the bank continued to demonstrate positive financial results and met current capital and liquidity requirements. Recent research emphasizes that effective risk management must consider not only current financial performance but also the potential impact of changes in the external environment on the organization's resilience [4]. An analysis of SVB's activities shows that the lack of a comprehensive assessment of interest rate risk and the relationship between asset structure and the deposit base was a key factor in the accumulation of hidden threats.

One of the reasons this signal went unnoticed for so long was the favorable economic environment of previous years. A prolonged period of low interest rates created the impression of the bank's business model's resilience, and its strong reputation among technology companies bolstered client and investor confidence. As a result, risk concentration was perceived as an acceptable feature of the bank's development strategy, rather than as a potential source of serious organizational vulnerability. Furthermore, subsequent investigations revealed that while banking supervision had identified individual issues, the response was insufficiently timely and effective.

The interest rate hike in 2022–2023 became a catalyst for already-accumulating problems. The decline in the market value of long-term bonds coincided with a massive outflow of deposits, leading to a liquidity crisis and the subsequent bankruptcy of the bank. Thus, the experience of Silicon Valley Bank demonstrates that ignoring concentration and interest rate risk can be one of the most significant hidden red flags, remaining virtually unnoticed until changes in the external environment reveal existing weaknesses in the risk management system [9].

3.3 FTX: Absence of Effective Corporate Governance as a Hidden Red Flag

The collapse of the FTX cryptocurrency exchange was one of the most significant corporate crises in recent years. Prior to its bankruptcy, the company was considered one of the world's leading cryptocurrency platforms, attracting millions of clients, large institutional investors, and significant amounts of capital. Despite rapid business growth and a high market valuation, serious corporate governance deficiencies gradually developed within the organization, which for a

long time remained virtually unnoticed by investors and other stakeholders.

One of the most significant hidden red flags in the FTX case was the lack of an effective corporate governance system. Subsequent investigations revealed that the company lacked the basic elements of good governance: clear lines of authority, independent oversight, an effective board of directors, and a robust internal control system. Many management decisions were made by a limited number of individuals without proper documentation or internal oversight, significantly increasing the likelihood of errors, abuses, and conflicts of interest. This organizational structure created conditions in which significant risks could accumulate undetected, despite the company's rapid growth.

From the perspective of the concept of hidden red flags, this case demonstrates that corporate governance deficiencies can remain hidden for a long time behind impressive business growth figures. In the academic literature, effective corporate governance is considered one of the key mechanisms for ensuring transparency, accountability, and control within an organization. A lack of independent oversight, weak internal control mechanisms, and concentrated decision-making significantly increase the likelihood of organizational problems accumulating and reduce a company's ability to promptly identify emerging risks [7].

One of the reasons this hidden red flag went unnoticed was the rapid growth of the cryptocurrency market and FTX's strong reputation as an innovative company. Rapid business expansion, large investments, and positive media coverage generated a high level of trust among customers and investors. As a result, corporate governance issues were long perceived as secondary to the company's financial growth and development.

FTX's subsequent bankruptcy demonstrated that the lack of effective corporate governance was not a secondary issue, but a key contributor to the organizational crisis. Deficiencies in the control and management system created conditions in which critical problems remained hidden for a long time and only emerged after a sharp deterioration in the company's financial position. Thus, FTX's experience confirms that weak corporate governance is one of the most dangerous hidden red flags, capable of remaining undetected for a long time behind an organization's seemingly successful performance [10].

3.4 Toshiba: Pressure to Achieve Unrealistic Performance Targets

Unlike previous cases, where the key hidden red flags were deficiencies in corporate governance, risk management, or organizational culture, the Toshiba case demonstrates how prolonged pressure to achieve financial results can gradually create the conditions for a corporate crisis. Subsequent investigations revealed that management's long-standing pressure to meet unrealistic targets was a significant factor in the distortion of financial statements and the weakening of corporate culture. Thus, the primary hidden red flag in this case was not the fraud itself, but the organizational environment, in which achieving results proved more important than objectively reflecting the company's actual situation.

Table 2

Toshiba: Hidden Red Flags Before the Accounting Scandal

Organizational Aspect	**Evidence Before the Collapse**	**Why It Was a Hidden Red Flag**
Performance Pressure	Unrealistic financial targets imposed by top management	Encouraged employees to prioritize targets over accurate reporting
Internal Control	Weak oversight of accounting practices	Limited open communication and discouraged reporting of problems
Corporate Culture	Reluctance to challenge management decisions	Reduced the likelihood of detecting reporting irregularities
Decision-Making	Strong top-down management style	Concentrated authority and limited independent judgment

Unlike Theranos and FTX, where hidden red flags were primarily related to deficiencies in corporate governance and limited transparency, at Toshiba, the key factor was prolonged pressure to achieve financial results. The company formally had a well-developed organizational structure and corporate governance system, but the corporate culture did not encourage open discussion of emerging issues. Employees felt pressure from management and were unwilling to challenge set goals, even if achieving them required the use of inappropriate accounting methods [11].

From the perspective of the hidden red flags concept, it is the persistent pressure to meet inflated targets that should be considered an early organizational signal. The drive for high results in itself is not a negative phenomenon. However, when combined with limited internal communication, weak independent controls, and highly centralized decision-making, it creates conditions in which the risk of financial misrepresentation increases significantly.

Thus, Toshiba's experience demonstrates that corporate failure can be driven not only by deficiencies in corporate governance or risk management, but also by an organizational culture focused solely on achieving results. This confirms the main idea of this study that

hidden red flags arise well before financial consequences and often reflect internal management processes rather than the state of financial statements.

3.5 Lessons from the Case Studies

An analysis of the case studies shows that corporate failures rarely occur out of the blue. Regardless of the industry or nature of the business, each was preceded by a buildup of hidden red flags related to internal organizational processes rather than financial performance.

Table 3

Comparison of Hidden Red Flags Across the Case Studies

Company	Primary Hidden Red Flag	Organizational Dimension	Why It Was Overlooked	Outcome
Theranos	Excessive secrecy	Organizational Environment	Innovation reputation and confidentiality	Corporate collapse
Silicon Valley Bank	Concentration and interest rate risk	Risk Management	Strong financial performance and favorable market conditions	Bank failure
FTX	Weak corporate governance	Corporate Governance	Rapid growth and investor confidence	Bankruptcy
Toshiba	Unrealistic performance targets	Strategic Management	Performance-oriented organizational culture	Accounting scandal and loss of trust

Despite differences between companies, all identified warning signs were linked to four key areas: corporate governance, risk management, organizational environment, and strategic decisions. Their common feature was that they were long-perceived as normal elements of successful business and therefore were not promptly assessed. Thus, the analysis confirms that hidden red flags can serve as important early indicators of a corporate crisis. Their timely detection requires a comprehensive assessment of the organization's internal processes, complementing traditional financial statement analysis.

Conclusion

The study found that corporate failures rarely occur suddenly. They are typically preceded by a cumulative accumulation of hidden red flags, related not to financial performance but to internal organizational processes. Based on an analysis of the scientific literature and case studies of Theranos, Silicon Valley Bank, FTX, and Toshiba, it was found that the most significant hidden red flags arise in four key areas: corporate governance, risk management, organizational environment, and strategic management. Despite differences between the companies, in all cases, these organizational problems gradually undermined the companies' resilience and contributed to their subsequent collapse.

The theoretical significance of the study lies in its systematization of existing approaches to understanding hidden red flags as early non-financial indicators of corporate crisis. The practical significance lies in the fact that the study's findings can be useful to auditors, investors, executives, and other stakeholders for the earlier identification of potential threats, complementing traditional financial statement analysis.

References

1. A. Wilkinson, K. Mellahi, (2004). Managing and coping with organizational failure: Introduction to the special issue. International Journal of Management Reviews, 5(1), 21-27.

2. F.A.R. Serra, G.G.S. Fiates, M.P. Ferreira, R. Pinto, (2017). Organizational decline research review: Challenges and issues for a future research agenda. BAR - Brazilian Administration Review, 14(2)

3. P. Bromiley, M. McShane, A. Nair, E. Rustambekov, (2015). Enterprise risk management: Review, critique, and research directions. Long Range Planning, 48(4), 265-276.

4. M. Arena, M. Arnaboldi, G. Azzone, (2010). The organizational dynamics of enterprise risk management. Accounting, Organizations and Society, 35(7), 659-675.

5. E.H. Schein, (2010). Organizational Culture and Leadership (4th ed.). San Francisco, CA: Jossey-Bass.

6. T.B. Bell, J.V. Carcello, (2000). A decision aid for assessing the likelihood of fraudulent financial reporting. Auditing: A Journal of Practice & Theory, 19(1), 169-184.

7. M.C. Jensen, (1993). The modern industrial revolution, exit, and the failure of internal control systems. Journal of Finance, 48(3), 831-880.

8. L. Rogal, (2021). Secrets, lies, and lessons from the Theranos scandal. Hastings Law Journal, 72(6), 1663-1701.

9. A. Metrick, (2024). The failure of Silicon Valley Bank and the panic of 2023. Journal of Economic Perspectives, 38(1), 133-152.

10. T. Conlon, S. Corbet, Y. Hu, (2023). The collapse of the FTX exchange: The end of cryptocurrency's age of innocence. The British Accounting Review.

11. S. Hass, P. Burnaby, M. Nakashima, (2018). Toshiba Corporation - How Could So Much Be So Wrong? Journal of Forensic and Investigative Accounting, 10(2, Special Issue), 267-277.

VOL 1, No 114 (2026)

Scientific discussion

(Praha, Czech Republic)

ISSN 3041-4245

The journal is registered and published in Czech Republic.

Articles are accepted each month.

Frequency: 12 issues per year.

Format - A4

All articles are reviewed

Free access to the electronic version of journal

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